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ABSTRACT

This report discusses the outcomes of a project that investigated the computer, information, and learning and adaptive technology needs and concerns of Canadian postsecondary students with disabilities. A series of four bilingual focus groups involving 31 individuals was held. Focus groups included postsecondary students with various disabilities; college and university personnel responsible for providing services to students with disabilities; professors; and academics, computer specialists, and other concerned individuals. The study found that: (1) colleges had a larger proportion of students with disabilities than universities; (2) the majority of students, regardless of type of disability, can and do use computer technologies to help them succeed; (3) personnel responsible for providing services to students with disabilities indicated the use of computers was not only beneficial for students but also cost effective; (4) about half of the students had two or more impairments; (5) the high cost of acquiring and maintaining computer technologies was the single most important and common issue noted by computer users and non-users alike; (6) the majority of students who had computer equipment at home indicated that they or their families had paid for it; and (7) most students did not know about the existence of a government program that would help them obtain computers or other adaptive technologies. An extensive appendix includes interview questions and relevant data. (Contains approximately 200 references.) (CR)

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Adaptech Project - Dawson College - Montreal

Learning Technologies: Students With Disabilities In Postsecondary Education

Final Report to the Office of Learning Technologies
Spring, 1999

Office of Learning Technologies
Bureau des technologies d'apprentissage

The OLT ... Your Partner in Lifelong Learning

Le BTA... votre partenaire pour l'apprentissage à vie

This project was made possible with funding support from the OLT.

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Learning Technologies: Students With Disabilities In Postsecondary Education

Final Report to the Office of Learning Technologies

Catherine S. Fichten, Ph.D.
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Adaptech Project
Dawson College
Montreal, Canada

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As we noted earlier, it is difficult to know where to stop. We would like to most sincerely thank the people and organisations whom we have named, as well as the many others whose names do not appear on this list but who have made important and substantial contributions to our research. You know who you are!

Catherine S. Fichten
Maria Barile
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EXECUTIVE SUMMARY

Computer and information technologies have the potential both to enhance the lives of people with disabilities as well as to deny them equality of access to education, jobs, and community life. In particular, these new technologies have the potential to enable or to create difficulties for students with disabilities in the new Canadian knowledge based economy. Concerns about these technologies and their accessibility for people with disabilities are evolving issues for the next decade.

Objectives

The goal of our research was to provide empirically based information to assist in decision making that ensures that new policies, software and hardware reflect the needs and concerns of a variety of individuals: postsecondary students with disabilities, their professors, and college and university personnel who make technological, adaptive, and other supports available to the higher education community.

Specific goals for the present investigation were to evaluate the use and utility of computer and information technologies in the postsecondary education of students with disabilities. Equally important was to make available empirical data to better advise: students, college and university personnel responsible for providing services to students with disabilities, planners, policy makers from both government and academic milieux, as well as developers and suppliers of mainstream and adaptive technologies. Specific objectives were:

- Explore what aspects of computer, information and adaptive technologies students with various disabilities find particularly useful
- Look at what educational and social goals are met by computer technologies.
- Explore the question of whether there are students who could benefit from computer technologies but fail to use them and, if so, why
- Identify how systemic variables, such as the availability of government subsidy programs and training, interact with individual differences, such as sex and specific disability, to help or hinder students in using computer technologies
- Evaluate existing trends in adapting software and hardware to the needs of people with disabilities in the postsecondary education community

Methodology

Between the fall of 1997 and the spring of 1999 we conducted a series of three investigations where the focus was on evaluating the computer, information, learning and adaptive technology needs and concerns of postsecondary students with disabilities.

To obtain an overview of issues and concerns, in Phase I (fall 1997) we conducted a series of four bilingual focus groups in the Montreal area. This involved 31 individuals. Groups were held for (1) postsecondary students with various disabilities, (2) college and university personnel responsible for providing services to students with disabilities, (3) professors from both arts and science disciplines, and (4) academics, computer specialists and other concerned individuals. From these meetings we obtained broad notions about some of the key issues of relevance to the effective use of computer, information and adaptive technologies by postsecondary students with disabilities.

In Phase II (spring 1998) we went across the country and conducted two sets of structured telephone interviews with 37 college and university students with disabilities (representing all provinces and territories) and with 30 college and university personnel responsible for providing services to students with disabilities nation-wide. Again, the main focus was on the computer, information and adaptive technology needs and concerns of students with disabilities. Interviews were conducted in both English and French. These interviews gave us much more detailed information concerning issues such as: what computer, information and adaptive technologies students with different disabilities have, use, and want; how students get funding for computer technologies; and what kinds of access to technology different types of institutions provide to students with various disabilities.

In Phase III (spring '99) questionnaires were mailed to the membership of our two student group partners, the National Educational Association Of Disabled Students (NEADS), and the Association Québécoise des étudiants(es) handicapés(es) au post secondaire (AQEHPS). With the cooperation of more than 200 college and university personnel responsible for providing services to students with disabilities, copies of our questionnaire were made available to students at campuses across Canada. Questionnaires were made available in both English and French in a number of alternate formats: regular and large print, on tape, in Braille, and on diskette (both IBM and Macintosh). 725 current and recent (within the past 2 years) postsecondary students with disabilities returned completed questionnaires.

Findings and Conclusions

Information provided shows that Canadian colleges had a significantly and substantially larger proportion of students with disabilities than did universities, suggesting that technologies for students with disabilities need to be included in the overall computer and information technology planning not only at universities, but also at colleges. The latter are sometimes overlooked. Our data suggest that the vast majority of college and university students, regardless of sex, age, program of study, or type of disability, can and do use computer technologies to help them succeed. The number and nature of the advantages that computer technologies had for participants show how critical computers are to the success of students with disabilities. It is also interesting to note that personnel responsible for providing services to students with disabilities indicated that they saw the use of computers not only as beneficial for the students but also as cost effective for the institution.

About 1/2 of the students in our samples had two or more impairments/disabilities, suggesting the need for adapted work stations which can accommodate the needs of students with various disabilities. In this regard, there was a pronounced trend for students to "cross-use" technologies, i.e., for students with one kind of disability to use technologies intended for students with a different type of disability. For example, software that reads what is on the screen is used not only by students with visual impairments but also by students who have a learning disability. Use of large screen monitors and voice recognition (dictation) software provide additional instances of this trend. Multiple uses of adaptive technologies seems to be an important development, and the increasing number of accessibility features built into widely available mainstream products are of considerable interest to students with disabilities. Nevertheless, recent developments in sophisticated adaptive technologies have underscored the increasing importance of ensuring that different types of adaptive equipment be able to work together. In particular, the video card requirements of magnification software and the heavy hardware and training demands of voice recognition programs should be taken into consideration.

Perhaps the single most outstanding finding of our studies relates to students' concerns over the cost of computer, information and adaptive technologies. Regardless of what question was asked or how it was formulated, the high cost of acquiring and maintaining computer technologies was the single most important and common issue noted by computer users and non-users alike. The majority of students who had computer equipment at home indicated that they or their families had paid for these. When asked why they did not take advantage of a government program to help them obtain a computer or adaptive technologies, the single most popular answer was that students simply did not know about the existence of such programs. The solution to the problem is obvious: organizations/agencies that provide money, loans or computer technologies to students with disabilities need to do more effective "outreach." More broadly based information dissemination to better inform students (in alternate formats), financial aid offices, postsecondary personnel responsible for providing services to students with disabilities, and rehabilitation professionals about available opportunities is clearly needed.

The nature and implications of our findings are evident. Students with disabilities can and do use computer and information technologies to help them succeed in postsecondary education. Computers are best seen as enabling technologies - "electronic curb-cuts" - that allow students with disabilities to prepare for and to participate in the knowledge based economy of tomorrow. To plan for the future rather than catch up with the past we recommend that the broadest based consultations take place at colleges, universities and organizations and agencies which provide equipment and training for students with disabilities. Such consultations must involve students, who, of course, are ultimately the end-users. Personnel responsible for providing services to students with disabilities, professors, academic computer staff, adaptive technology and computer specialists, librarians, audio-visual specialists, rehabilitation professionals, college and university administrators, and representatives of various government agencies, among others, are key players in this equation. Creative partnerships and alliances are urgently needed.

Planning and decisions for campus-wide information technology purchases and systems development and implementation in postsecondary educational institutions are actively going on as this report is being prepared. In much of the planning, the needs of students with disabilities are simply overlooked - not taken into consideration - until it is discovered, much too late, that the expensive new campus-wide technology is inaccessible. Designing for accessibility always results in better, less expensive, and more timely solutions than retrofits. Data to guide decision making and specific recommendations concerning what could be done to ensure full access to postsecondary education for all of the students enrolled in Canadian colleges and universities are included in this report.

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RÉSUMÉ DU PROJET

Les technologies informatiques et d'information offrent la possibilité d'améliorer le niveau de vie des personnes handicapées ainsi que de présenter pour elles, un obstacle vers l'égalité d'accès à l'éducation, à l'emploi ou à la vie en communauté. Plus précisément, ces nouvelles technologies ont le potentiel de venir en aide aux étudiant(e)s ayant des incapacités mais elles peuvent également amplifier ou même créer des difficultés supplémentaires pour les étudiants vivant dans la nouvelle économie canadienne reposant sur les connaissances. L'intérêt et les efforts portant sur ces technologies et leur accessibilité pour les étudiant(e)s handicapé(e)s deviendront plus prononcés dans la décennie à venir.

Objectifs

Le but de notre recherche est d'offrir des informations reposant sur des données empiriques afin d'assister les prises de décision en s'assurant que les nouvelles politiques, les équipements matériels et les logiciels récents reflètent les besoins et les inquiétudes d'une variété d'individus: étudiant(e)s handicapé(e)s au niveau postsecondaire, leurs professeur(e)s et le personnel des collèges et des universités qui mettent à la disposition de la communauté académique différents supports y compris les technologies informatiques ou adaptées.

Les principales visées de cette étude sont l'évaluation de l'usage et de l'utilité des technologies informatiques et d'information dans l'enseignement postsecondaire des étudiant(e)s ayant des incapacités. De même, il nous semblait important de rendre les résultats disponibles afin de conseiller les étudiant(e)s handicapé(e)s, les planificateurs, les instances gouvernementales et académiques, ainsi que les fabricants et les distributeurs d'équipements informatiques (courants et adaptés). Les objectifs spécifiques étaient :

- Explorer quelles sont les facettes des technologies informatiques, d'information et adaptées qui sont les plus utiles pour les étudiant(e)s ayant des incapacités
- Identifier, en termes sociaux et éducationnels, les buts recherchés par l'usage des technologies informatiques
- Explorer et expliquer l'absence d'usage des technologies informatiques par certains étudiant(e)s qui pourraient en bénéficier
- Identifier comment des variables systémiques, tels les programmes de subventions ou de formation, en interaction avec les caractéristiques individuelles, comme le genre et la spécificité de la déficience, favorisent ou entravent l'usage des nouvelles technologies
- Évaluer les tendances actuelles afin d'adapter les équipements matériels et les logiciels aux besoins des personnes ayant des incapacités

Méthodologie

De l'automne 1997 au printemps 1999, nous avons entrepris une série de 3 enquêtes qui se concentraient sur les besoins et inquiétudes des étudiant(e)s handicapé(e)s au niveau postsecondaire en ce qui concerne les technologies informatiques, d'information, les besoins d'apprentissage et d'adaptations.

Afin d'obtenir un aperçu de la problématique, à la Phase I (automne 1997), nous avons réalisé 4 séries de groupes de focus dans la région de Montréal. Ces derniers concernaient 31 individus. Les groupes réunissaient (1) des étudiant(e)s ayant des incapacités, (2) des membres du personnel responsable des services aux étudiant(e)s handicapé(e)s dans les collèges et universités, (3) des enseignant(e)s du domaine des arts et des sciences, (4) des spécialistes en informatique ou au niveau académique ainsi que toute autre personne intéressée. A partir de ces rencontres, nous avons obtenu diverses perspectives sur les principales questions pertinentes au sujet de l'usage efficace des technologies informatiques, d'information et adaptées par les étudiant(e)s handicapé(e)s au niveau postsecondaire.

Pendant la Phase II (printemps, 1998), nous avons, à une échelle nationale, soumis à des entrevues structurées 37 collégien(ne)s et universitaires ayant des incapacités (représentatifs des provinces et territoires) et 30 responsables des services aux étudiant(e)s handicapé(e)s du niveau collégial ou universitaire. Encore une fois, cette étape visait l'étude des besoins et inquiétudes des étudiant(e)s ayant des incapacités et des technologies informatiques, d'information et adaptées. Nous avons effectué les entrevues en anglais et en français. Nous y avons recueilli des informations détaillées sur le type de technologies informatiques, d'information ou adaptées que les étudiant(e)s ayant des incapacités ont, utilisent ou désirent; sur ce que les étudiant(e)s pensaient du financement de ces technologies; et quelle forme prend l'accessibilité aux technologies pour les étudiant(e)s handicapé(e)s de différents établissements d'enseignement.

A la Phase III (printemps 1999), nous avons distribué les questionnaires aux membres de l'Association nationale des étudiant(e)s handicapé(e)s au niveau postsecondaire (NEADS) et à ceux de l'Association québécoise des étudiant(e)s handicapé(e)s au postsecondaire (AQEHPS). Avec la collaboration de plus de 200 responsables des services aux étudiant(e)s handicapé(e)s des collèges et universités, nous avons mis ces questionnaires à la disposition des étudiant(e)s dans les campus à travers le Canada. Les questionnaires étaient disponibles en anglais et en français, ainsi qu'en médias substituts : caractères réguliers, gros caractères, cassette audio, Braille, disquette (IBM et Macintosh). 725 étudiant(e)s handicapé(e)s fréquentant un établissement postsecondaire ou ayant récemment été au niveau postsecondaire (dans les 2 dernières années) ont complétés les questionnaires.

Résultats Et Conclusions

Les résultats indiquent que les collèges ont une proportion d'étudiant(e)s handicapé(e)s significativement et substantiellement plus grande que celle des universités, ce qui signifie que les technologies pour les étudiant(e)s handicapé(e)s doivent être comprises lors de la planification des technologies informatiques, d'information et adaptée aussi bien dans les universités que dans les collèges. Ce qui n'est pas toujours le cas. Nos données suggèrent que la plus grande majorité des collégien(ne)s et universitaires, indépendamment du sexe, de l'âge, du domaine d'étude ou du type de handicap, peuvent utiliser et utilisent les technologies informatiques pour faciliter leur succès académique. Le nombre et la nature des avantages que les technologies informatiques offraient aux étudiant(e)s révèlent l'apport capital des ordinateurs à leur succès. Il est également intéressant de noter que les responsables des services aux étudiant(e)s handicapé(e)s signalent les bénéfices des technologies informatiques pour les étudiant(e)s ainsi qu'au niveau des coûts effectifs pour les établissements d'enseignement.

Environ 1/2 des étudiant(e)s de notre échantillon avaient 2 déficiences/incapacités ou plus, révélant, par conséquent, le besoin de postes de travail adaptés à une variété d'incapacités. À ce sujet, nous avons remarqué une tendance accrue pour «l'interutilisation» des technologies. C'est-à-dire que les étudiant(e)s ayant un type de handicap utilisait des technologies adaptées à un différent type d'incapacité. Par exemple, le logiciel qui lit ce qui apparaît à l'écran était utilisé non seulement par les étudiants avec une déficience visuelle, mais aussi par ceux ayant un trouble d'apprentissage. L'utilisation de moniteurs à grand écran et de logiciels de reconnaissance vocale (dictée) offrent des exemples complémentaires à cette tendance. L'usage multiple des technologies adaptées constitue un développement important. De plus, le nombre croissant d'options d'accessibilité incluses dans les produits courants intéresse considérablement les étudiant(e)s ayant des incapacités. D'autant plus que de récents développements dans les technologies adaptées sophistiquées appuient l'importance de la polyvalence des équipements adaptés. En particulier, les exigences de la carte vidéo pour les logiciels d'agrandissement, l'équipement lourd et les demandes de la formation pour les programmes de reconnaissance vocale devraient être pris en considération.

Le résultat le plus marquant de notre étude fait référence aux inquiétudes sur les coûts des technologies informatiques, d'information et adaptées. Nonobstant le sujet ou la formulation de la question, le coût élevé de l'achat et du maintien des technologies informatiques était la plus éminente et commune préoccupation soulignée autant par les usagers que les non-usagers d'ordinateurs. La majorité des étudiant(e)s possédant un ordinateur à la maison avaient défrayé les coûts, ou leur famille avait payé pour l'appareil. Lorsque nous leur avons demandé pourquoi ils n'avaient pas eu recours à un programme gouvernemental pour faciliter l'acquisition de technologies informatiques ou adaptées, l'ignorance de l'existence de tel programme constituait la réponse la plus fréquente. La solution à ce problème est évidente: les organismes/agences qui offrent des subventions, des prêts ou des technologies informatiques aux étudiant(e)s handicapé(e)s doivent les rejoindre de manière plus efficace. Une information plus concrète et concise (en médias substituts) sur les alternatives disponibles est clairement nécessaire pour les étudiant(e)s ayant des incapacités, pour les bureaux d'aide financière ainsi que pour les responsables des services aux étudiant(e)s handicapé(e)s.

La nature et les implications de nos résultats sont claires. Les étudiant(e)s handicapé(e)s peuvent utiliser et utilisent déjà les technologies informatiques et d'information pour contribuer à leur succès académique au niveau postsecondaire. Les ordinateurs sont davantage perçus comme une technologie, telle une «rampe inclinée électronique», favorisant ainsi la préparation des étudiant(e)s pour la prochaine économie basée sur la connaissance. Afin de planifier le futur, plutôt que de rattraper le passé, nous suggérons que les consultations de grande envergure aient lieu dans les collèges, les universités, les organisations et les agences qui distribuent des équipements et offrent une formation aux étudiant(e)s ayant des incapacités. Évidemment, ces réunions devront inclure les étudiant(e)s qui, en bout de ligne, en sont les usagers. Le personnel responsable des services aux étudiant(e)s handicapé(e)s, les enseignant(e)s, les technicien(ne)s informatiques, les spécialistes en technologies informatiques et adaptées, les bibliothécaires, les spécialistes audiovisuel(le)s, les professionnel(le)s en réadaptation, les cadres des collèges et universités, les représentant(e)s d'une variété d'agences gouvernementales et plusieurs autres font tous partie intégrale de cette équation. Des partenariats et des ententes s'avèrent donc nécessaires.

Une planification et des décisions sur l'achat de technologies d'information, le système de développement et l'appareillement dans les établissements d'enseignement postsecondaire sont actuellement en cours au moment même où ce rapport se prépare. Cependant, lors de la majorité des planifications, les besoins des étudiant(e)s ayant des incapacités sont éclipsés jusqu'à ce qu'on découvre, souvent trop tard, que les technologies coûteuses du campus sont inaccessibles. Concevoir des adaptations résulte en une meilleure solution qui sera moins coûteuse et plus opportune qu'une résolution rétroactive. Des données empiriques offrant des directives quant aux prises de décisions et des recommandations spécifiques visant à assurer l'accessibilité complète aux étudiant(e)s du niveau postsecondaire inscrit(e)s dans les collèges et universités canadiens, sont jointes à ce rapport.

Information Pour Nous Rejoindre

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INTRODUCTION

Preamble

Computer and information technologies have the potential both of enhancing the lives of people with disabilities as well as of denying them equality of access to education, jobs, and community life. The goal of our research is to provide empirically based information to assist in decision making that ensures that new policies, software and hardware reflect the needs and concerns of a variety of individuals: postsecondary students, professors who teach students with disabilities, and college and university personnel responsible for providing services to students with disabilities who make technological, adaptive, and other supports available to the higher education community.

Equipment, training programs, opinion, technological adaptations, case studies, demonstration projects, web sites, on-line journals and policy statements proliferate. Nevertheless, searches of the ERIC, PsycINFO, and MEDLINE data bases showed that in spite of the proliferation of information, there is virtually no empirical research which evaluates the use or the utility of computer or information technologies in the postsecondary education of students with disabilities.

Before proceeding further, we feel it is important to note that we use terminology such as disability and impairment interchangeably. These terms are not reflective of any specific models of disability.

Because computer technologies are expensive and can contribute to negative experiences and learning outcomes (e.g., create barriers between people, skill destroying), it is important to make available empirical data to better advise stakeholders in a number of areas: student groups, personnel who provide services to students with disabilities, professors, administrators, planners, policy makers, developers and suppliers of both mainstream and adaptive technologies. It is the need for information which is based not in individual but in collective experiences that makes this research not only timely, but also urgent.

Objectives

The overall objective of this research is to provide information needed to ensure that recent advances in computer and learning technologies in the delivery of postsecondary education and training reflect the needs and concerns of three groups: students with disabilities, the professors who teach them, and the service providers who make technological and other academic supports available.

Our methodology includes questionnaires, interviews, and focus groups. The data we present provide an empirical basis to assist with current practices in the acquisition and administration of computer and information technologies in Canadian colleges and universities. Our intent is to show how these can be inclusive of the needs of people with all types of disabilities and impairments and to make recommendations to ensure that emerging technologies and innovations in virtual learning environments follow the spirit of both "A part... égale" (OPHQ, 1984) and the "1992 Forum" (Dufour, 1992) in respect to ensuring full access to people with disabilities to postsecondary education.

Background

The technological revolution in postsecondary education is still at an early stage of development and the shift in educational paradigm from traditional classroom to that with a range of diverse technologies is still in its infancy. Our research is at the forefront of this exciting area.

While we believe that there are substantial benefits in using learning technologies by people with physical, sensory and learning disabilities, the use of learning and information technologies in this context is still only at the conceptual level and consumers may not be part of the conceptualisation. Our research ensures a voice for the end users and ensures that the needs and wishes of the end users (students, personnel responsible for providing services to students with disabilities, professors) are reflected in policies, priorities, and procedures in Canadian postsecondary educational institutions.

Our main concern, of course, is with effective learning and information technologies for postsecondary students; we are particularly interested in enhancing postsecondary educational opportunities for students with disabilities and in facilitating the use of learning technologies which can assist them in their ongoing integration into the social economy.

People with disabilities are likely to be empowered by the use of learning and information technologies. Thus, they will be able to contribute to the new economy, allowing people with disabilities the opportunity to become experts in new technological fields. For the professors who teach courses, the technologies will be a means to reach greater numbers of students with different learning styles, thereby enriching the teaching profession and enhancing personal satisfaction (Paul, 1994). The new economy is a technologically based economy. By contributing in the enhancement of educational opportunities for individuals that have been labelled disadvantaged in the past, we will be contributing not only to their success but also to the success of the new Canadian economy.

Dawson College has over 150 students with various disabilities (AQEHPS, 1999), as do many Canadian postsecondary institutions. However, colleges and universities throughout Canada have varied numbers of students with disabilities. Our findings and recommendations will be disseminated to groups of college students and service providers as well as to consumer and government organizations to ensure that both end users and policy makers are made aware of the findings. Our results and recommendations are relevant to postsecondary institutions with both large and small populations of students with disabilities.

Contribution To Knowledge

The next millennium will be marked by increased usage of computer and information technologies. In the case of people with disabilities, these may involve new products or old products used in new ways. For example, videos and CD-ROMs are old methods of teaching that, for a long time, rendered instruction inaccessible to students with hearing impairments. Today, both of these teaching techniques are rendered accessible in two ways. First, there has been an increased use of closed as well as open captioning (i.e., writing what is said - see Encarta 98 for an example of a CD-ROM with captions). Second, companies that produce assistive technologies such as hearing aids and FM systems are now including components that facilitate access to computer generated sound via computer output compatible FM systems (e.g., PHONAK). Similar advances are occurring with respect to other technologies that benefit people with other types of disabilities; this true both for hardware as well as software.

"Does CMC present individuals with disabilities opportunities or barriers?" This is the provocative title of Gold's (1997) recent article in CMC Magazine. To ensure that students with disabilities who need information about computer, information and adaptive technologies are provided with this quickly and accurately, it is imperative that staff working in offices providing services to students with disabilities be aware that these technologies exist and that they know how to operate them. In turn, they can transmit that knowledge to the students. As well, this technological know-how can be transmitted to professors. In the knowledge-based society of the 21st century it is imperative that the emerging educational system be environmentally friendly to all individuals, including people with disabilities.

Equipment, training programs, opinion, technological adaptations, case studies, demonstration projects, web sites, on-line journals of opinion, and policy statements proliferate. For example, there are several books written on the topic of computer, information and adaptive technologies (e.g., Alliance for Technology Access, 1994; Cunningham & Combs, 1997; Brown 1989). Trend setting American organizations such as EASI (e.g., Staff Writers, 1998) and the Trace Center (e.g., Trace Research & Development Center, undated) have published extensively on the topic. Canadian sources, such as "The Node" have hosted forums and published listings of resources (e.g., Staff Writers, 1998) and sophisticated, technologically savvy service providers, such as the University of Calgary's Merlin Keillor and Set B.C.'s (British Columbia) Gladys Loewen have presented their views and opinions at well attended Canadian and US conferences such as CADSPPE (CACUSS) and AHEAD. Nevertheless, with the exception of our own investigation, there is virtually no empirical research which evaluates the use or the utility of computer or learning technologies in the postsecondary education of students with disabilities. Notable exceptions concern evaluations of the effects specific learning strategies for students with learning disabilities (e.g., Learning Disabilities Association, 1996; Lewis, 1998; Higgins & Zvi, 1995; Raskind & Higgins, 1998) and evaluations of satisfaction and media usage of students with print disabilities (Epp, 1996, 1998). Because information and learning technologies are expensive and can contribute to negative experiences and learning outcomes (e.g., create barriers between people, skill destroying), it is important to make data available to better advise students, service providers, planners, and policy makers, as well as developers and suppliers of both mainstream and adaptive technologies.

Empirical data about the effective - or ineffective - uses of computer, information and adaptive technologies in postsecondary education are scarce in all countries. In the United States, the Americans with Disabilities Act (ADA, 1990) dramatically transformed all aspects of living for people with disabilities; this includes accessibility of postsecondary educational institutions (Bausch, 1994) and of adaptive technology. For example, a recent study by Jeffrey (1996) on using learning technologies to assist students with disabilities in journalism class illustrates the role that the ADA is playing in advancing the use of such technologies. There are some American data on the views of personnel responsible for providing services to students with disabilities as well as about institutional concerns (Burgstahler, 1993; Burris, 1998; Horn & Shell, 1990; Lance, 1996). Because many aspects of the Canadian situation are different (cf. Government of Canada, 1996), it is not appropriate to generalize from the U.S. experience. Information is needed about both software and hardware for effective learning by Canadian postsecondary students with a variety of disabilities in Canadian postsecondary educational institutions.

There were some technology questions included in the latest Canadian NEADS survey (Wolforth, Connolly, Mellway, Hubka & Killean, 1998). Our study differs from the NEADS survey in many ways, not the least of which is that ours is the first Canadian study where the focus is exclusively on students' and service providers' views and concerns about their involvement with computer, information and adaptive technologies.

Postsecondary Education For People With Disabilities

Learning technologies are rapidly expanding in all fields and are becoming important tools in the new economy; consequently, computer-based knowledge is imperative to secure employment. Computer literacy and know how must become part of everyone's education. To ensure that people with disabilities form an integral part of the new economy, it is important that new learning and information technologies are accessible to them. As the Honourable Pierre S. Pettigrew of Human Resources Development Canada recently noted at a convention of students with disabilities (1998, Nov.), "...our goal is quite simply to make Canada a barrier-free society for its citizens with disabilities... I have high hopes that your generation will be the one that brings us there... To do that, you need equitable access to the tools of change. And those include the tools of learning. I am a very strong believer in the power of learning. And not just because we have become a knowledge-based economy, although that is very important, but also because an educated society is a more open one."

It is only in the past two decades that higher educational institutions have begun to recognize the need to grant accommodations to people with disabilities (Fichten, Bourdon, Creti, & Martos, 1987). During this time, the number of people with disabilities in postsecondary education has increased dramatically (Henderson, 1995; Lavoie, 1986; Leitch, 1995; Louis Harris & Associates, 1994; McGill, Roberts, & Warick, 1994; Tousignant, 1989; Wolforth, 1995). Postsecondary education for people who have a disability is important for the same reasons as it is for non disabled people; it helps to fulfill personal goals, allows for effective competition in the job market and contributes to independence and financial security. In fact, a college education is more important for people who have a disability. It has been shown, for example, that although employment figures for university graduates with disabilities is somewhat lower than that of their nondisabled peers, it is still substantially higher than that of students who did not complete university, who, in turn, fare better than those who never went to college (Government of Canada, 1994; Louis Harris & Associates, 1994).

Women with disabilities

Women with disabilities face other problems as well. The number of women with disabilities that have attained university degrees in the past, has been significantly lower than the number of men with disabilities (Gagnon, 1996; Barile, 1996). The proportion of Canadian female computer users is considerably lower than the number of males [approximately 30% vs 70% of the GVU Center's Canadian and Australian data set (GVU, 1998)], even though a recent study on college students Busch (1995) found no gender differences in attitudes or self-efficacy expectations concerning using specific software. It is noteworthy that a study by the Secretary of State of Canada found that of 82 women with disabilities responding to questions on discrimination, 23 (41%) cited school as the area where they met most discrimination (Larouche, 1992).

Use of computer, information and adaptive technologies by people with disabilities

Because these lack accessible features, the characteristics of some existing computer and information technologies prevent access by people with various disabilities. For example, some educational CD-ROMs have small print or a very light background which cannot be changed, and many classroom videos have no closed captioning. Some people have difficulties accessing internet web sites due to screen sizes and colors (Schoffro, 1996), while others, most notably people who are blind, have difficulties because graphic images do not have verbal descriptive tags for text based browsers and screen readers (Vanderheiden, Chisholm, & Ewers, 1996).

Such handicapping environments (cf. Fougeyrollas, 1990) need not exist. In the past, technologies have worked in the service of people with disabilities by reducing or eliminating barriers. Computer, information and adaptive technologies can continue this trend by working for - rather than against - people with disabilities.

Bissonnette's review (1995) shows that the use of technologies to advance the education of people with disabilities has been an ongoing successful process for some time. The benefits of online education for students with disabilities have been described extensively (e.g., Shumila & Shumila, 1998) and there are data available which suggest that participation by students with disabilities in computer supports provided in offices for students with disabilities was related to better academic performance (Shell, Horn, & Severs, 1988). Moreover, people with disabilities who have a high level of computer skill were shown to have more favorable employment outcomes (Pell, Gillies, & Carss, 1997). Clearly, new information and learning technologies used for the purpose of assisting all people through life-long learning must continue to be inclusive of people with disabilities.

One goal of this project is to evaluate the existing trend to adapt software to the needs of people with disabilities. For example, Aurora Systems Inc. and Microsoft have both built in adaptations for people with disabilities (Lowney, 1995). Thus far, we have seen that companies such as Apple and IBM have made substantial investments in designing accessible hardware for people with disabilities. People with various physical limitations in both academic and employment settings are becoming aware of the availability of ergonomically designed hardware such as keyboards that are easier to use for people with carpal tunnel disorders. In addition, new specialized technologies have emerged: these include Aurora's communication station - a system of components that can be used to attach augmentative communication devices, laptop computer trays and other equipment suitable for mounting on wheelchairs, beds, and tables (Aurora, 1996).

As part of the research, we have also investigated whether people with disabilities are using these technologies. If yes, how satisfied are they? If not, why not? Is it for financial reasons or lack of access (see Hill, 1966)? Or, is it "computer anxiety," as is the case for many nondisabled students (Hudiburg, Ahrens, & Jones, 1994)?

Overview Of The Research

For the past 15 months we have been conducting a series of three investigations where the focus was on evaluating the computer, information, learning and adaptive technology needs and concerns of postsecondary students with disabilities. This project, which has three phases, began in the fall of 1998 and terminated in the spring of 1999.

In Phase I we conducted four focus groups: one with postsecondary students with disabilities, one with personnel who provide services to students with disabilities at colleges and universities, one with professors, and one with academics and computer technologists and other concerned individuals. From these meetings we obtained broad notions about what some of the key issues of interest to students with disabilities are. In Phase II we went across the country and conducted structured telephone interviews with college and university students with disabilities in each of our provinces and territories, and with college and university service providers nation-wide. Again, the main focus was on the needs and concerns of students. Interviews were conducted in both English and French. These interviews gave us much more detailed information on such issues as: what computer, information and adaptive technologies students have, use, and want; how students get funding for computer technologies, and what kinds of access to technology institutions provide to students with different types of disabilities. In Phase III, with the help of our partners and more than 200 college and university personnel responsible for providing services to students with disabilities we distributed closed-ended questionnaires in both English and French in regular and large print, audiotape, Braille and disk (both IBM-PC and Mac). We have forged several productive partnerships and our preliminary results have been disseminated in a variety of ways (see our team's CV in Appendix 1).

PARTNERSHIPS AND LINKS FORGED DURING THE GRANT PERIOD

Organizations

During the past year we have forged a variety of important and productive partnerships. In particular, we have been working in close partnership with the Canada-wide group of postsecondary students with disabilities [National Educational Association of Disabled Students (NEADS) - based at University of Ottawa] the Québec student group [l'Association Québécoise des étudiants handicapés au postsecondaire (AQEHPS) - based at Université de Montréal], and with the western and eastern Québec groups of personnel who provide services to cegep students with disabilities [Service d'Aide à l'Intégration Des Élèves (SAIDE) - based at Cegep du Vieux Montreal - and Le Services aux étudiants handicapés du Cégep de Sainte-Foy - based in Quebec] as well as with a Montreal based rehabilitation agency (Mackay Center).

Other Realizations

To date, we have published articles, presented at exhibitions and conferences (see Appendix 1) and set up a bilingual web page <http://omega.dawsoncollege.qc.ca/adaptech>. We also have an electronic discussion list on the Internet which is moderated by Jennison Asuncion <adaptech@alcor.concordia.ca>.

Adaptech's Online Presence

"Where can we go to get information on technology?" This was a comment we heard frequently throughout our research. In response to this need and to alert the virtual community of our existence, we launched two web-based initiatives: the Adaptech Web Site at <http://omega.dawsoncollege.qc.ca/adaptech> and our online electronic discussion forum: Adaptech.

The Adaptech Web Site provides a fixed location where individuals are able to learn about our various research projects and publications, find out about who we are and who funds us, and obtain information about our online electronic discussion forum: Adaptech. Visitors are given access to what we think are some of the best online resources on computer and adaptive technologies for students with disabilities at the postsecondary level. Although we list sites of interest from across the world, Canadian sites are prominently featured. Our web site is, of course, bilingual and fully accessible. We feel that in our Resource Pages we have assembled some of the best starting points for those who are looking to become better informed about computer, information and adaptive technologies for both Anglophone and Francophone postsecondary students with disabilities. The list is constantly growing.

In the early stages of our research we decided that in order for our work to have a strong impact, it had to be "out there" for people to discover. We also firmly believe in "demystifying" our research and in making the process transparent. Conceived as a means to make the research as interactive as possible, our moderated electronic discussion forum, Adaptech, has evolved into an important vehicle for sharing and exchanging information on the use of computer technologies by and for postsecondary students with disabilities. What makes this forum different from others is that it is focused on issues of interest to the higher education community. As this document is being written, there are over 160 subscribers. They include students with disabilities, personnel responsible for providing services to students with disabilities, professors, adaptive and mainstream computer experts, and others interested in the themes of our work. We take pride in our ability to link together individuals from communities across Canada and around the world to discuss computer, information and adaptive technologies for students with disabilities. Information concerning how to join the forum is available on our web site.

In publicising both our web site and electronic discussion forum we have deliberately cast a wide net. We have actively promoted our web initiatives not only within the disability community but also within broad sectors of the higher education and computing communities. This is in recognition of the fact that if change is to occur, information must be made available to all the players.

Key Project Personnel

The Research Team

The core research group consists of a team of academics, students, consumers, and professionals interested in computer, information and adaptive technologies in colleges and universities. Our team is made up of people with vast experience in conducting research of various types and several of us have the personal experience of living with disabilities. We have substantial experience with grant funded research, with information dissemination to various "stakeholder" groups, including people with disabilities, policy makers, end-users, educators, and academics, and, we have conducted projects in collaboration with educational, public and non-profit organizations concerned with issues related to the social integration of people with various disabilities.

Psychologist Catherine S. Fichten, social worker Maria Barile and graduate student Jennison V. Asuncion assumed the overall intellectual direction of the project. Other team members supported the objectives by contributing expertise and skills in specific areas. As a research team, most of us have worked together for many years. We have extensive connections with the disability and education communities. We also have experience with questionnaires administered on a web site, focus groups, open-ended interviews, content analysis, questionnaire development, and psychometric evaluations. We also have substantial computer and statistical capability.

Catherine S. Fichten, Ph.D. (Psychology Professor at Dawson College, affiliated with the Jewish General Hospital, Assistant Professor at McGill University): Project Director

***Maria Barile, M.S.W.** (Dawson College, Disability Activist and Social Worker): Project Co-Director

***Jennison Asuncion, B.A.** (M.A. Candidate, Educational Technology, Concordia University, VP: National Educational Association of Disabled Students "NEADS"): Project Coordinator - expertise in networking, listservs and information dissemination

Iris Alapin, B.Sc. (M.A. Candidate, Psychology, Concordia University): Research Assistant - Francophone

Rhonda Amsel, M.Sc. (McGill University: Professor, Statistician & Associate Dean of Students): Statistical consultant

Myrtis Fossey, D.E.C. (B.A. student McGill University): Research Assistant

***Christian Généreux, D.E.C.** (B.A. Student, Political Science, Université du Québec à Montréal; President of AQEHPS): Research Assistant - Francophone - extensive experience with computer needs of people with disabilities

Jean-Pierre Guimont, M.Ed. (Information Specialist and Head - Audio/Visual Production, Dawson College): Resource Person - Francophone

***Darlene Judd, D.E.C.** (Montreal Association for the Blind, Dawson College): Research Assistant with extensive interviewing expertise

***Jason Lavers, B.A.** (Montreal Association for the Blind, Dawson College) Research Assistant with extensive microcomputer and web page expertise

Evelyn Reid, D.E.C. (B.A. Student, Psychology, Concordia University): Research Assistant

Chantal Robillard, B.A. (M.A. Candidate, Sexologie, Université du Québec à Montréal, Dawson College): Research Assistant - Francophone - expertise in qualitative data analysis techniques

***Fay Schipper, M.Ed.** (Volunteers Coordinator, Mackay Center): Resource Person

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These research team members have a disability.

Partners

Advisory Board

In addition, our research has been guided by an active Advisory Board. This includes members form a variety of constituencies and provides us with assistance and information about issues in both the English and French communities. A list of Advisory Board members is available in Appendix 2. In addition, we have had the support of over 160 subscribers to our listserv Adaptech, which is devoted to our research and to computer and information technologies in the Canadian postsecondary educational context.

To better inform our research, an Advisory Board composed of representatives from the following "stakeholder" groups has been guiding our work. The Advisory Board's support has worked exceptionally well in that it allowed us to have a broader perspective about the realities of the groups that we were researching.

Advisory Board members were able to participate in all phases of this investigation. They were contacted 9 times during our current project, mainly through e-mail, but also through the telephone, TTD, and regular mail. Members from the following categories comprise the board.

(1) Postsecondary Students From Distance Education, Community Colleges And Universities Across Canada

(2) Academic Psychologists Who Specialize in Education, Visual Impairment, Disability, and Aging

(3) College And University Personnel Responsible For Providing Services To Students With Disabilities

(4) Specialists from Industry, Educational Institutions, Disability Organizations

Partnerships

The following organizations are currently partners of our research.

***Association québécoise des étudiants handicapés au postsecondaire (AQEHPS) - based at Université de Montréal.** AQEHPS is interested in the project because of their concerns about ensuring that information and learning technologies used in postsecondary institutions are appropriate and accessible to students with special needs.

***Betacom Group - A Canadian assistive devices industry firm based in Toronto.** Betacom is a Canadian company specializing in technology for people with disabilities.

***CADSPPE (Canadian Association of Disability Service Providers in Post-secondary Education)** is the Canadian association of student services professionals who provide assistance and resources to postsecondary students with disabilities. This group was only recently formed.

***Centre for the Study of Learning and Performance (CSLP), Concordia University.** The CSLP conducts research in areas including the wise use of technology for learning. The CSLP is a multidisciplinary unit drawing on students and faculty from a variety of graduate programmes at Concordia University including Educational Technology and Psychology. The CSLP also enjoys active links with other postsecondary institutions in Quebec.

***Dawson College** - Dawson College is interested in expanding its computer, intranet, and related facilities and in using available research on learning technologies to accomplish this. Dawson is also committed to educational diversity and to the more than 150 students with disabilities currently enrolled.

***EvNet (Network for the Evaluation of Education and Training Technologies).** This is a national multi-disciplinary and multi-sectorial high tech research network of 33 academic researchers, 35 practitioners, and 61 public private and non-profit organizations.

***Mackay Center** - this is a rehabilitation center based in Montreal. We have been involved in planning a computer, information and adaptive technologies demonstration facility in partnership with the Mackay Center to enable students and others with disabilities to try computer software and hardware before buying.

***National Educational Association of Disabled Students (NEADS) - based at University of Ottawa**. NEADS is the only Canada-wide association of postsecondary students with disabilities.

***Office des personnes handicapées du Québec (OPHQ).** Through its work integration program - Contrat d'Integration au Travail (CIT) - since the fall of 1996 the OPHQ has been funding a portion of the salaries of some Research Team members.

***Ordinateur Dream Scape Computers.** This company specialises in internet research, software installation and troubleshooting, creation of posters for special events, and computer consulting and training. A specific interest of the firm concerns computer training and adaptation for people with physical, sensory and intellectual deficits.

Service d'Aide à l'Intégration Des Élèves (SAIDE) - based at Cégep du Vieux Montréal. This is the Western Québec group of Cegep based personnel providing services to college students with disabilities in Quebec. We are currently collaborating on a study which involves an in-depth evaluation of the computer, information and adaptive technology needs and concerns of Cegep service providers and students with disabilities.

Le Services aux étudiants handicapés du Cégep de Sainte-Foy - based in Quebec City. This is the Western Quebec group of Cegep based personnel providing services to college students with disabilities in Quebec. We are currently collaborating on a study which involves an in-depth evaluation of the computer, information and adaptive technology needs and concerns of Cegep service providers and students with disabilities.

Dissemination

Results will be disseminated to the scholarly community via journal articles and conference presentations. End users will be informed about the findings via conventional (print based final report) as well as alternative means, including a web page and broad based distribution to listservs and newsgroups. Intended target groups are: postsecondary students with disabilities, study participants, college and university personnel responsible for providing services to students with disabilities, counselors, administrators and computer technology support personnel in charge of computers in postsecondary educational institutions, organizations for people with various disabilities, suppliers of adaptive technology, mainstream and adapted software and courseware developers as well as hardware manufacturers and distributors.

In addition, reports will be sent to: national, provincial, and local organizations of and for people with disabilities. These organizations will be asked to inform their member groups by way of regular mail or internal newsletter. Similarly, we will send copies to rehabilitation centers, government agencies, professional associations, including the Canadian Association of Guidance Counselors, and other groups concerned with the issues. Our partners and Advisory Board will be of great help in assisting us with suitable venues for dissemination of the findings in both the scholarly, consumer, and "gray" literatures.

It should be noted that our team has been particularly effective in disseminating information not only to the scholarly community, but also to the community of end users and policy makers. For example, we have shared our findings on professor and student interactions with those who educate college students, with rehabilitation professionals (Fichten, 1985a, 1985b, in press; Wolforth & Fichten, 1991), with college students who have disabilities (Fichten, 1994), as well as with the larger disability community (Fichten, 1995a). We have also learned about a variety of French and English newsletters and conferences during our current project. For example, it can be seen in our "team CV" (see Appendix 1) that we have already disseminated our preliminary results in a large variety of sources.

We will also send copies of our findings to the "media," including mainstream computer and education magazines as well as various magazines for people with disabilities.

METHOD

Overview in Outline Form

Phase I - 4 Focus Groups

- Bilingual
- 31 Participants
- Students with disabilities
- Personnel responsible for providing services to students with disabilities
- Professors
- "Ragtag" (i.e., others)

Phase II - Interviews

- 37 students and 30 college and university personnel responsible for providing services to students with disabilities
- 10 provinces, 2 territories
- English and French
- Universities, colleges, distance education

Phase III - Questionnaire

- 725 students with disabilities
- Cross Canada
- English and French

PHASE I: FOCUS GROUPS – METHOD AND FINDINGS

Overview

To obtain an overview of issues and concerns, in Phase I (fall 1997) we conducted a series of four bilingual focus groups in the Montreal area. This involved 31 individuals. Groups were held for (1) postsecondary students with various disabilities, (2) college and university personnel responsible for providing services to students with disabilities, (3) professors from both arts and science disciplines, and (4) academics, computer specialists and other concerned individuals. From these meetings we obtained broad notions about some of the key issues of relevance to the effective use of computer, information and adaptive technologies by postsecondary students with disabilities.

Introduction

The main objective of these focus groups was to obtain data that would allow us to create a questionnaire. They were conducted with this goal in mind. This is in accordance with Morgan's (1988) view that focus groups can be categorized as qualitative research where the methodology and analyses are not traditional, specific, or continual.

Why focus groups?

The topic of computer, information, and adaptive technologies and students with disabilities in post-secondary institutions is a relatively new area of research. In fact, review of the literature revealed very little empirical research regarding this subject in Canada. Consequently, we felt it was important to understand the issue from a "grass roots" perspective. Morgan (1998) suggests that focus groups can provide clues about how respondents might talk about a new topic, what type of language would be used, etc., enabling researchers to identify items for scale construction. The use of focus groups, as illustrated by Morgan (1988) and Kruger (1994), presents a concrete starting point that can assist in the creation of a comprehensive questionnaire in an area of disability research that seems virtually unexplored. Essentially, our goal was to gather new information on an issue that was relatively unknown to the general public, the researchers themselves and, in some ways, to the parties concerned.

Since our intent was to gather information about the experiences of students with disabilities in the area of computer information and adaptive technologies, we initially planned to have three separate focus groups; students with disabilities, college and university personnel responsible for providing services to students with disabilities, and other concerned individuals. It soon became apparent that the issue of how students obtained their technologies, as well as if and where they were able to use these depended, to a great extent, on other people and educational policies. Thus, we enlarged our scope. The investigation lead us to review another aspect of the system. What were students' classroom experiences when using computers? If students had the technologies, what were the barriers to using them? Who, among direct service providers, had information about computer and information technologies? What, if any, role do professors have in facilitating the use of computers in the classroom? As these compelling questions emerged, the necessity for a fourth focus group became apparent: the professor focus group.

Methodology

The main objective of the focus groups was to obtain data that would allow us to create a structured interview protocol.

Data Gathering

The data were gathered in the following way. A series of questions were designed to obtain preliminary information from participants. Some questions were composed of two parts, some were parallel questions that allowed participants with diverse experiences to respond, and others were uniform questions to which all could respond. In each focus group session two note takers were used and the proceedings were audio taped to gather information as accurately as possible. This process was followed for each group. To respect confidentiality of participants, their names as well as the names of their educational institutions were omitted from all transcriptions and reports. Furthermore, the sex of participants is protected using "s/he" comments whenever reference is made to individual participants.

How The Focus Groups Were Conducted

We set up four focus groups with the intent of gathering information about experiences of students with disabilities in the area of computer information and adaptive technologies. To obtain this information, participants were asked a series of questions and were given a time limit to answer each. This took place in both French and English (see Appendix 3).

After the question period, we opened the discussion to a "free-for-all," where participants were given the opportunity to share other experiences or ask questions of their own. Groups were informed that the meeting was bilingual, allowing participants to feel free to answer in either language. Regarding the issue of confidentiality, we assured participants that all information shared with us would remain confidential and be used only for the purposes of this project.

The initial focus groups that were set up included students, personnel responsible for providing services to students with disabilities, and a group we called "ragtag" - this consisted of people interested in this project who came from diverse backgrounds. Based on comments made by participants, we formed a final focus group comprised of professors.

How We Got Participants

Our team contacted offices for students with disabilities to recruit students from English and French postsecondary institutions in the Montreal area. The same approach was used for personnel responsible for providing services to students with disabilities and professors. The majority of participants were from English institutions and, despite the popular belief that the field of computer technologies is male dominated, each of our focus groups included at least one more female than male.

The student focus group consisted of 12 students (7 female and 5 male). Three of the students were in university while the others attended Cegep. Only one was from a French speaking university while the others attended English speaking institutions. Students had a variety of disabilities.

The focus group for personnel responsible for providing services to students with disabilities included six participants (4 female and 2 male). Four service providers worked in offices for students with disabilities. The other two individuals were a psychologist at a school for children with disabilities and a trainer from an assistive technology manufacturing/distribution company.

The "ragtag" focus group was comprised of eight participants (5 female and 3 male). This group included postsecondary instructors who were not available to attend the professor focus group, computer technicians who gave us a rare view of technological realities, and people who had an interest and/or expertise in the area of disability. Some of the participants had disabilities. In addition, participants for this group were recruited from our Advisory Board. Although these individuals were primarily from assistive technology industries, others were simply people on the Board who were interested in the issue.

The professor focus group consisted of five participants (3 female and 2 male). This group included four professors and one academic observer who participated despite her non-teaching position.

It should be noted that these focus groups were atypical in comparison to other focus groups which have been utilized for research purposes. The objective here, however, was to gather basic information to develop a comprehensive interview protocol.

How The Data Were Reviewed

The review of the focus group data is presented as follows. We looked at the responses for each question in each focus group. The notes taken during the meeting were reviewed along with the verbatim transcriptions. Elements of focus group analysis - how the data were handled, how categories were developed, how the data were verified, as well as systematic analysis - followed Morgan's (1988) definition. This ensured that biased interpretation of the responses was kept to a minimum.

How The Data Were Handled

The notes from the focus groups were systematically categorized. An attempt was made to keep the data error-free. It remains possible, however, that one might make errors in interpreting participants' statements or by setting up very limited categories.

In three of the four focus groups, the majority of participants' statements remained intact; these are presented in quotes. Only the ragtag focus group required more summary and interpretation on our part. Nevertheless, to maintain the integrity of participants' statements, portions of sentences are included. Verb tense was changed only if utterances were grammatically incorrect or unfinished. These changes are indicated with parentheses.

How Categories Were Developed

Each focus group was analyzed separately. Thus, categories may or may not be the same in the four groups. Headings indicate categories as derived for analysis from each question in each focus group.

Within each category, responses as summarized by the note takers are included. The only changes made are in spelling and punctuation. If unrelated but relevant comments to a specific question were made by the participants that the note takers recorded, then they were placed in the discussion section. For the most part, any personal observations were reserved for the summary sections. Summaries include key findings. Specific summaries are included for the whole group, as well as for each question whenever it was needed. This approach is consistent with the elements of Freire's (1989) concept of dialogue.

How The Data Were Verified

The data within each focus group were reviewed, one question at a time, by subcategories. Selection of categories was based, in part, on the questions. For example, questions regarding advantages and disadvantages led to the creation of categories with these very headings, among others.

Systematic Analysis

A systematic analysis of focus group data was done in the following manner. Each focus group's questions were divided into categories and sometimes sub-categories. Then, a small comparative analysis was made between each focus groups' responses with respect to the main issues. These were: computer, information and adaptive technologies from the perspective of students with disabilities, service providers, professors, and "ragtag" participants. Each group presented and represented unique perspectives.

Limitations

There are many limitations to the review of the focus groups. Although parts of the participatory frame of reference are used to review the data, only one person conducted the analysis. Thus, it is not participatory in practice. Therefore, it seems that the review method is more consistent with the perspective of focus groups as qualitative research (Morgan, 1988). As such, the data obtained via the focus groups, similar to data obtained via individual interviews, can be used as preliminary information to assist with the construction of a structured interview protocol.

Although there were several people with disabilities on the team that constructed the questions, only one was currently a student. This limited our perspective. In relation to the student participants, an attempt was made to keep their statements alive and accord them a predominant voice in the review by keeping comments in their original language (i.e., English or French) and grammatical form. The most important limitation of this participatory review is the fact that although we do have verbatim transcriptions of the meetings, we must still rely on interpretations of what was said.

Conclusion

In the conclusion, an attempt is made to bring together recurring themes. It contains parts of summaries from the various focus groups, showing the similarities and differences between them. Krueger's (1994) principle of focus group analysis suggests that analysis should seek to enlighten or bring alternative explanations to the query arising from a focus group. The analysis and conclusion have attempted to do so.

Focus Group # 1

Students

The student focus group consisted of 12 students. Questions are presented in Appendix 2. Their responses to the questions reflected both the nature of participants' disabilities and whether or not they were consistent users of computer, information and adaptive technologies.

Question 1

What advantages and disadvantages do you see that computer information and adaptive technologies have for students with disabilities?

In Question 1, students' perceptions of the advantages and disadvantages of computer information and adaptive technologies are examined. Responses to this question are divided into two sections: advantages and disadvantages. The section on advantages is further divided into five subcategories while the disadvantages are grouped into four subcategories.

Advantages

Responses by students with disabilities reflected the statement by Roulstone (1993) that using computer technologies is seen as a way to enhance access. In effect, the advantages of using computer technologies can be grouped into five major categories: assist with the specific task of writing, computers as a means to faster access, organization of work, time issues, and personal growth.

Assist with the specific task of writing

Here, students mentioned the following: "one can write properly and neatly without worry," "benefits of typing: exercising one's fingers," and "spell check can be an advantage or a disadvantage."

Computers as a means to faster access

Others suggested that computers could help surmount barriers caused by specific impairments. One person suggested that, "for Deaf or physically impaired students, it is possible to use the computer to communicate with teachers via e-mail."

Beyond the classroom itself, other students stated that the computer allows for "meilleur accès à l'information (ex., "bibliothèque sur CD-ROM")." Computers also allow "facilité de communication," for students with communication impairments. Some students were specific in defining how computers and/or computer adaptations facilitated access to specific tasks: "uses synthesized screen reader, (it is) very helpful. It allows me to do essays." Students also "have texts on tape." Another student said s/he uses a "computer that enlarges text." One student seemed to reflect the overall view about the advantages of computers: "computers remove disability."

Organization of work

In addition, computers seem to assist students with organization: "I do not worry about mistakes or organization. I can get ideas down quickly and worry about corrections later," and "always have a copy of your own work on file." Some students also cited the cost of organizing: "less time consuming than using conventional means." An example of time-consuming conventional means would be organizing work on cue cards and then having to frequently rewrite these. Another student indicated that using a computer during "exams affords better organization."

Time issues

Speeding up the execution of tasks seemed to be an advantage that was attributed to computers by people with a wide range of disabilities. Students seemed to indicate that "computer work is faster and neater." In addition, it "saves time on assignments." Furthermore, "using computers and texts on tape helps in terms of time."

Personal growth

The one area of advantages that is perhaps more disability-specific is that of personal growth, and it is not surprising that people with disabilities would look at computers and adaptive technologies as another way of eliminating physical and personal barriers. People stated that with computers one has "moins de dépendence." It "gives power to believe in myself more, and (I'm) self-confident, (it) feels clearer."

Disadvantages

The disadvantages of using computer technologies can be grouped into four major areas: academics, training and assistance in usage, attitudinal and classroom problems, and disability-specific disadvantages.

Academics

Students mentioned disadvantages related to academics such as, "I forget how to spell." Another student felt that computer technologies were "bad because it creates a dependence." Others felt that specific programs were unreliable: "problem with spell checking is that it does not pick up all errors." Others mentioned: "the cost, it's expensive to have a computer!"

Training and assistance in usage

The four students who mentioned training and need for assistance appeared to be reflecting a reality that was further explored by service providers: "the programs are updated and more training is necessary; this is time consuming." This can be true for all. However, one student was more precise: "technology is changing and it's difficult for people with disabilities to catch up." Others related specific problems with lack of assistance: "when I'm stuck (e.g., on the weekend), there is no one to offer assistance."

Attitudinal and other classroom problems

These are difficulties mentioned by students that are not directly caused by technologies. They pertain to the fact that technology is used to maintain existing biased attitudes: "in class, I feel that (classmates) are annoyed when I use a computer during exams." Other students reported on general difficulties in the classroom: "in class, the problem is that despite note taking, a lot of on-the-spot information is lost (e.g., calculus class)." Others have more general complaints regarding the role of computers: "the removal of face-to-face interaction."

Disability-specific disadvantages

Some students with mobility impairments named specific software and hardware as having disadvantages for them: "mouse," "Dragon Dictate." Others mentioned that some "programs are too fast." Another relayed how a specific task was disadvantageous for him/her: "typing is very tiresome for some people with hand dexterity problems. For papers and assignments, I can't type fast and voice recognition is not helpful because it doesn't recognize my words."

The internet causes different disadvantages for students with mobility impairments and for students with visual impairments: "can't work well on the internet because it requires the use of a mouse and I can't control it very well (time constraint)." Other students spoke of adaptive technologies causing difficulties: "I have problems with voice synthesizer, there's not enough detail to navigate successfully through complex programs," "difficult to access internet even with screen reader because there are so many graphics." In a more general manner, various students reported that the fact that "technology changes and one is always trying to catch up" becomes a disadvantage. Also, one must account for "la fragilité de l'équipment."

Question 2

a) What personal experiences have you had, if any, in the use of these technologies?

b) What factors do you feel prevent or help access to these technologies?

Only four students responded to the first part of this question with respect to their experiences with technologies. These experiences were a combination of how or where they obtained their technologies as well as the qualities and misadventures they experienced.

One student stated: "got a computer when I went to Cegep." Another: "I got a Toshiba 2000 and learnt Microsoft." A third student said that s/he was "granted a computer with Dragon Dictate and I also had recordings of books." A fourth student spoke of difficulties encountered.

All students responded to part (b) of the question (i.e., what prevented them from using technologies). Part (b) was subdivided into six areas: cost, problems with access to software/hardware, lack of appropriate software/hardware, attitudes as barriers, policy related problems, and lack of information about existing funding programs.

Cost

Cost is cited by six students as a factor that prevents them from using computer technologies. The students' responses included personal experiences: one student reported that s/he knew of many helpful programs but cost prevents access to them. Another student remarked, " it costs a lot of money (people can't afford technologies anymore)," and " I would like (to have access to) the internet and a computer, but I can't afford it."

High cost was also related to the replacement of items. Other problems involved tape recordings (i.e., chewed up tapes, etc.). Other students made suggestions with respect to funding: "il devrait y avoir plus de flexibilité par rapport au gouvernement et aux programmes financiers."

Problems with access to software/hardware

Some of the software/hardware problems are not disability related. For instance, "I have a computer at home but it has low power and it takes a long time for it to load programs," "first time I went to Cegep, I had a really heavy laptop and as such left it at home often," "computers break down and I am at a loss," and "documents get erased."

Some students mentioned hardware problems that interfere with adaptations: "Dragon Dictate doesn't work with the cheap sound cards at my Cegep." Others mentioned problems caused by the inaccessibility of the primary software in certain technologies, "problems with Windows: icons are useless for the blind." This causes overall barriers to people with specific disabilities.

Students also related frustration with adaptive computer technologies: "it is frustrating when I lose documents because of the synthesizer." Other problems included: "can't access internet information because of lousy programs."

Lack of appropriate software/hardware

Some students referred to a shortage of programs that might be of assistance with respect to their specific needs: "there are no specialized programs for dyslexia, thus, I must still rely on a proofreader."

Attitudes as barriers

Whereas some technologies are able to diminish the importance of some technical barriers, old barriers such as "attitudinal barriers" still remain. Sometimes these are transposed onto the new technologies. As revealed by one student: "I wanted a note taker but the professor wouldn't allow it. Once I got a computer, I still had problems gaining acceptance from others."

One student reported an experience with the acquisition of much needed technologies. One year, s/he obtained a computer (Macintosh) and learned how to use it: "In the following year, someone else needed that computer and I was forced to give it up in exchange for another, an IBM, which required that I learn a whole new system." Other students spoke of how having different brands of computers at home and school "creates compatibility problems" (i.e., compatibility with respect to work done on one brand at home that may not be transferable to the computer at school). Furthermore, students in such a situation find themselves having to learn two systems. This is time consuming.

Policy related problems

Students were aware of how educational and loan policies create difficulties: "policies establish who can obtain technologies." Students informed us that in cases such as the following, they are limited as to the type of assistance that they may obtain: the student is a seasonal worker and "there are no bursaries to get a computer" (this applies to part-time students).

How policy defines severity of impairment was cited as a factor in preventing the use of technologies. One student indicated that in some cases the degree of a "hearing loss is not serious enough to get access to free technologies." Students say that they have "problems even when sitting in the front of the class to lip read because then note taking is impossible." "Ideally, I would have a laptop because I could type while lip reading." One student stated that insurance can also create constraints: "un an de négociation avant d'avoir de l'aide financière. Maintenant, j'ai un problème avec les assurances contre les bris."

Lack of information on existing funding programs

Students also affirmed that there is a lack of information about existing subsidy programs: "many people wait to get into programs and don't know what to ask for. People should be trained to be able to answer everyone's needs." Others say, "if you are in a career program, it is difficult to keep in touch with service providers." One suggestion by students is that with respect to computer programs, one should focus on developing programs that everybody can learn.

Summary

Initial word count for Question 1 resulted in: "expensive" and "cost too much" being noted five times each, "training" being mentioned three times, and "teaching" being recorded once. Expenses of computer technologies, updates etc., were mentioned as a disadvantage a total of ten times. Six of the students mentioned this. This was followed by need for training and/or retraining.

Personal growth and self-confidence were clear non-technological advantages mentioned by some students.

Three students mentioned that the same products had both advantages and disadvantages. This however, was a function of the nature of the disability and the size of the class. It appears as though people recognize that technologies which are useful can also create a form of dependence. For example, spell checkers are useful but can also create a form of dependence in that one might forget how to spell. Irving Zola is cited alluding to this problem, which he calls "the over-technicalization of care" (Oliver, 1990). Zola was concerned that technology would overcompensate to the point of making one feel useless. It is evident that students are seeing both the advantages and disadvantages of computer technologies, giving them a balanced perspective.

For Question 2, students appeared to be citing more elements that prevent access to technologies. Some students felt that policies created barriers, whilst others stated that they lacked information about subsidy programs.

Cost was cited more often in this question than in Question 1. As well, students reported on the limitations of technologies. Most of them presented concrete shortcomings of various software and hardware items.

Some students said that the attitudes of teachers and fellow students created barriers in their using technologies in class.

When comparing disadvantages and advantages, students cited fewer advantages. The fact that technology may be creating additional barriers for students with various impairments, similar to those existing in the rest of society, is discouraging.

One possible reason why students cited more disadvantages may be their lack of financial freedom. This lack might mean students have access to lower quality computer technologies. In the section on policies and subsidy programs that assist students with disabilities to obtain computer technologies in Quebec one notices that these policies do not treat students with different impairments in an egalitarian way. Some students are excluded completely, notably students with learning disabilities. Others are allowed some types of assistive technologies, but not computers. For example, students with hearing impairments can have access to a C-Note system only if their hearing loss is greater than 70 decibels. Moreover, they must make a choice between this technology and other forms of assistance. For each impairment grouping, there are specific requirements.

Policy makers exacerbate existing barriers by viewing the problems as originating from within the individual. They try to remediate or accommodate individual impairments, rather than assuming that the primary problem exists within the social structure (as suggested by the social model of disability cf. Oliver, 1990, 1996; Swain, Finkelstein, French, & Oliver, 1996). A shift away from the current ideology might allow students with disabilities to be treated fairly within a social structure that would permit the development and distribution of technologies that are accessible.

The students' responses seem to indicate that a substantial effort is needed to educate manufacturers of computer technologies and that strong laws are needed to render technologies accessible. Will we approach the next millennium with a knowledge-based, technologically sophisticated society wherein people with disabilities will again be the largest members of the new underclass?

Focus Group # 2

Personnel Responsible For Providing Services To Students With Disabilities

Personnel responsible for providing services to students with disabilities are the front line people who make various services available to students with disabilities in the academic milieu. Given their role, we asked them questions about factors that could facilitate students' academic life. Institutional policies concerning adaptive technologies and funding were priorities. Specific questions asked are available in Appendix 2.

Question 1

What are funding sources for adaptive, computer and information technologies?

Responses are divided into government and non-government sources. It should be noted that all responses pertain to the Quebec context.

Government sources

Participants seemed to be aware of a variety of sources. Some of their responses pertained to assistive devices rather than to computer technologies. For instance, "Quebec government provides money for TTYs as far as we know," "only source for ownership in home may be answering machine for TTY." Others mentioned specific Quebec government sources such as the Office des personnes handicapées du Québec (OPHQ), the Ministère de l'Education (MEQ), and funding from the Régie de l'assurance maladie du Québec (RAMQ). Participants did not indicate whether these were specifically for students.

One individual offered information on specific funding for Quebec university and college students with disabilities. "When it comes to personal equipment, the government will pay only if other organisations won't pay." Another participant gave a brief definition of the funding process: "At the university level, which is different from the Cegep level, students are individually funded. University students apply directly to the Direction générale de l'aide financière (Programme Allocation pour les besoins particuliers des étudiant(e)s atteint(e)s d'une déficience fonctionnelle majeure) under a section called material resources (this is a component of the program). Services, adaptive transport and information technology would fall under the material resources heading. (Anybody) with a physical disability can apply for computer technologies, whatever access additions they need: voice synthesizers, scanning system, input devices, trackballs, mouth stick, whatever you need to make an integrative system. That covers pretty much everybody... This is a fairly strict definition, but everybody is covered under that definition, except for people with learning disabilities. They do not fall into the definition at this point of time."

The service provider also gave some examples: "Somebody with a hearing impairment who uses the oral method can apply for a portable computer if they're going to be using computerized note-taking in the class. That's under the understanding that the second computer in a two-computer system is supplied by the university where the student is studying."

According to the personnel responsible for providing services to students with disabilities, students with a visual impairment would not apply under this program. They apply to a program called the Programme d'aide visuelle (PAV), administered by RAMQ. Equipment is distributed to students by designated institutions. Equipment is on loan to the individual, but belongs to the institution. Nevertheless, students with visual impairments can apply to the Ministry of Education for bursaries.

At the Cegep level, financial assistance for services and equipment is given in a lump sum to the Cegep. In most cases, the budget is given to two major Cegeps. This is known as the Direction de l'enseignement collégial budget reserved for "l'acquisition d'aide technique".

Personal equipment

Another service provider explained that general equipment for those with a hearing impairment can be obtained from RAMQ as well.

Non-government sources (foundations, private companies and others)

Participants gave examples of private funding sources such as, "Rotary Club, Lions Club, and individual organizations such as War Amps." They did not elaborate on how often or what type of assistance these organizations provided, except that one of our participants added that one group, "used to provide (the Rotary Club about ten years ago) for students disabled from accidents (car, etc.), no questions asked. They gave a lot of money."

Questions and comments

One of the benefits of focus groups is that they allow for an exchange of information, thereby giving something back to the participants. Information is empowering (Freire, 1992). In many ways, focus groups allow participants to voice their concerns. Often, these are issues of which researchers are unaware.

Personnel responsible for providing services to students with disabilities were candid about some of their concerns. One participant said that one of the biggest crises is that more and more of their clientele are not eligible for government programs and that they must look at ways to challenge the government. With respect to funding sources in Quebec, personnel responsible for providing services to students with disabilities stated that "when applying for funding, there's no upper limit whereas in Ontario, etc., they might have a $3000 limit."

Question 2

a) If the college or university owns adaptive computer technologies, how do service providers learn how to use it, and who provides the technological supports and training?

b) How do students learn how to use adaptive computer technologies?

Although this question has two parts, most participants responded only to one or the other. Therefore, this question was divided into 'how service providers learn' and 'how students learn'.

All personnel responsible for providing services to students with disabilities indicated that they were self-taught. For example, "our staff provides training by sitting down with the manual or consulting with the provider. We're also self-taught through experience with people who use the services themselves," and "students are a great resource because either they already know or can spend the time to learn. Have to be very harsh and dedicate time to learn to get things working."

Problems encountered

> *"One discovers things after product is bought; it doesn't come out of the box and work (e.g., compatibility problems). In Quebec, it's difficult to get into the system, but once in, you're fully covered except for training. There's no funding and the companies charge $600 a day. Service providers did not provide training. You get people coming from different backgrounds: some students know while others don't. We fill in where the organizations have not (provided service)."*

One participant made an interesting and appropriate analogy, "it's hard to learn to drive a car if you don't have one." S/he added, "we're not allowed to provide tutoring with money." Another service provider asked, "but is training equal to tutoring?"

Questions and comments

Another issue raised concerned the question of training, "whose responsibility is it anyway to provide training?" With respect to some students, service providers informed us that some students need to be trained before they can get on the waiting list for equipment. Others pointed out that the population is largely mobility impaired, the majority use computer technologies, and they arrive at postsecondary educational institutions with the skills already in place. They never have to pay for trainers because they are able to get student volunteers.

From the service providers' responses, the notion that both service providers and students are learning technologies without systematic training becomes apparent.

Question 3

Comment on the role of other departments, such as audio-visual and the library, in providing adaptive computer services.

Of the four individuals present, three responded directly to this question. At one university, the office providing services to students with disabilities takes responsibility for specialized equipment located away from their premises, "even though we don't deal with staff (from other departments)."

All three service providers claimed that these departments rely on the know-how of the office providing services to students with disabilities to learn and service specialized equipment. As stated by one participant, "really, we are the only ones with extensive knowledge about the technology." Why this occurs is illustrated by the following comments: "the staff doesn't remember how to use the equipment. We wish it was different but the library has a constant change of staff. They can be trained for a day but by the time they are needed, they've forgotten the information," and "the real issue is how to fit together all the systems that are available. We need to decentralize."

Open discussion following Question 3 centered around the issue of frustration. Some participants expressed frustration at the institution's expectation that they are responsible for everything that concerns students with disabilities. "It's frustrating to be treated like a 'local expert.' People forget but we can't blame them, although it is very frustrating." "...sometimes legitimate, but when we're always called about (issues) that aren't related to specialized skills, the person isn't thinking beyond 'disability' and so it goes to our office (e.g., the disabled door should be fixed by the door company and yet we get calls anytime it doesn't work)."

Question 4

How are decisions made in your institution about what adaptive computer technologies students use?

Responses fall into two categories: unofficial decision making (no formal established process), and official decision making.

The more official process is illustrated by the following: "decisions are made in the office providing services to students with disabilities - keep itself on mailing lists, e-mail, snail-mail (e.g., EASI discussion list)."

The less official process, which is cited by the majority of personnel responsible for providing services to students with disabilities, works as follows. "We listen to students about what they use and what they've heard and then we make recommendations," "we do research, get demos, make recommendations, get feedback from students, and we inform students about what's out there," "call other service providers, network, consult each other, get opinions, try to harmonize as much as possible," "some consult organizations for people with disabilities, the internet and students with expertise," and "look at prices, where located." It can be concluded that, for the most part, decisions are primarily made in an informal way by the service providers.

Question 5

Technology is always changing. How do you obtain the most current information on those changes?

This question also made an attempt to see if there is a formal process of gathering information. Of the people who responded to this question, three mentioned, "word of mouth." Two others mentioned exchange of information by e-mail. Another participant noted that "you can do a lot of research on the World Wide Web also (but it takes time). With discussion lists, you can get connections with people that 'pop up' often. You can also get information from reading the news, etc. People will send you clippings. The Web is also good."

Responses of the participants suggest that there does not appear to be an organized information gathering method whereby students and personnel responsible for providing services to students with disabilities can be updated and informed about changes in the area of computer technologies. Nor is there evidence of an established means of acquiring up-to-date information on recent developments. Moreover, service providers' frustration about limited time is evident. This issue came up often during this focus group session, indicating that acquiring information about new developments in computer technologies becomes a low priority given the constraints of their job.

Discussion

In the free-for-all section discussion centered on the following topics: suggestions, concerns, questions, and information seeking/sharing.

Suggestions

One individual summarized the feeling expressed by most participants in the session, "would it not be nice if we had more time, money, trained staff, and the latest equipment?"

Concerns

As one participant stated, "When we learn for ourselves about the adaptive technology, it feels like students are getting the short end of the stick. We don't have enough time to network. It's like teachers have 'pedagogical days' but we don't get that. If we're really stuck, I can get a replacement, but this shouldn't have to be done."

Questions

Adaptive technology accommodations for students with physical disabilities are relatively straightforward but what about students with learning disabilities? What kind of software exists for them? "We don't know what kind of technology exists." "What's more advantageous: loaning of technology or ownership?" "I'm curious about students' comfort level with different technologies: does it have to do with personality or training? I think people could use technology for years and still not be comfortable. We should try to make sure that students have the skills they need. If we knew more, maybe we could train them better."

Information seeking/sharing

One person asked, "are students allowed to take the laptops home? Who's accountable?" The sharing of information regarding procedure in this matter came from only one service provider. "We loan them out for two or three days and they are insured off-campus. I also suspect that they are covered at home, except for the deductible of course. If we purchase new items, then we add them onto the insurance."

One person asked about equipment. "How do students know about what is available to them? How long does it take to get the equipment?" A service provider responded that:

> *"Once you put in the form, you get a response within four to six weeks. After your initial application, they'll send the first half of the money. When you send in the receipt you get the remainder. The most time-consuming part is to get the paperwork done (e.g., if you need three quotes, there might not always be three places that can provide them)."*

Summary

Although there were few participants, the conversation for each question was very fluid, making categorization of responses more difficult than was the case for the student focus group. Nonetheless, some of the issues raised by the students were seen here as well: cost, rapidly changing technologies, and limitations of policy and training.

Service providers' individual issues were grounded in time constraints; this issue was noted six times by the four participants, making this a predominant concern for them.

The open discussion with personnel responsible for providing services to students with disabilities covered many issues of interest. The exchange and sharing of information seemed to benefit the service providers as much as the students. Some among them asked about specific products. In reference to a product called Alphasmart: "it is a keyboard with a little memory and you can plug it into a PC or a Mac. It's lightweight, durable, and lasts up to 200 hours on a battery." Everyone was interested in the details.

In all, it appears that with the advent of technologies in academic life, "the role of service providers is changing - the job descriptions are changing."

In the focus group notes there appeared to be lots of different information about policies that govern financial assistance to students with disabilities. In Quebec, students with disabilities can benefit from various programs for the purchase or loaning of equipment as well as bursaries. One of these is the Programme d'allocation pour les besoins particuliers des étudiant(e)s atteint(e)s d'une déficience fonctionnelle majeure. Students considered as having a major functional disability will be given the possibility of having their loans and bursaries changed into bursaries only. If students cannot attend full-time studies as established by the MEQ because of a major functional disability, they may attend part-time and be considered as full-time students for the purpose of the bursaries program.

Theoretically, part of the loan is converted into a bursary for students with disabilities so that they do not have to pay off a debt. As is the case for all bursary applicants, students with disabilities must meet certain criteria, income (i.e., parents' income) being an important factor. A student can be categorized as either "dependent" or "independent" from their parents' income. Students are considered "independent" if they meet set requirements as stipulated by the program. With respect to disability identification, the program stipulates that the student must:

a. Have a minimum hearing capacity of 25 decibels
b. Have paralyses affecting one limb
c. Have paralyses affecting one or more limbs
d. Have a speech and language impairment
e. Be a Canadian citizen or landed immigrant, permanent resident in accordance with the immigration law
f. Be a resident of Quebec (Programme d'allocation pour les besoins particuliers des étudiant(e)s atteint(e)s d'une déficience fonctionnelle majeure)

Under the "material resources" section of the "Programme d'allocation pour les besoins particuliers des étudiant(e)s atteint(e)s d'une déficience fonctionnelle majeure" certain equipment is covered, based on the student's type and degree of disability.

A second program mentioned is the "Programme d'aide visuelle" (Visual Aid Program). This program is administered under RAMQ. It covers a variety of different visual aids. The Visual Aid Program is a loan program. The students must apply at one of the institutions designated by the Ministry.

Hearing aids, wheelchairs, and other equipment are covered under RAMQ or the "Commission de santé et sécurité au travail" (CSST), depending under which program the applicant qualifies. At this time, the Quebec government is reviewing some of these programs. Thus, regulations are subject to change.

Focus Group # 3

Ragtag

The ragtag focus group's responses were as diverse as the participants' backgrounds. There were a few similarities with the professor focus group. Participants in this group expressed their opinions freely and the conversation was often unstructured. As was the case for the professor focus group, participants' remarks were excluded if these were not relevant to the questions asked. Focus group questions are available in Appendix 2.

Question 1

What are developments in computer, information and adaptive technologies in your area that are/ should be/ or could be useful to people with different disabilities?

Participants interpreted this question very broadly. Some responded with personal experiences while others spoke about knowledge they had regarding specific products. Responses were divided into four categories: computer software and hardware, exchange of information on new technologies, problems related to technologies, and ongoing experimental research.

Computer software and hardware

Participants mentioned the benefits and pitfalls of certain technologies such as voice recognition. Some expressed the desire to see greater use of technology. Other participants noted new technologies that they had come across (e.g., a pen and pad device that was easier to use than a mouse, "WritePad" from Texas).

Exchange of information on new technologies

There was an exchange of information between participants regarding where one could go for updates on new technologies. For example, one participant mentioned a recent invention known as the NADA chair that s/he found out about by attending the COMDEX convention in Toronto in 1997. In addition, someone mentioned that the Disabled Students Centre at a specific Cegep had information for students with disabilities. The participants also alluded to web-based instructional material.

Problems related to technologies

Problems related to technologies were discussed here also. This is a subject that is mentioned in all four focus groups. One person suggested that, "while computers are good for most students, they create special problems for visually impaired." More specifically, Windows was mentioned as, "not helpful to visually impaired." In this focus group, as in most others, the issue of upgrading computers was also singled out as problematic.

Some of the participants in this group expressed concerns related to the usage of other technologies to accommodate students with disabilities. One professor shared an experience and made suggestions: "when visually impaired students need to take an exam, it's too much of a hassle. I would like to see some mini-centers where a teacher may borrow a machine when needed. It would save time and energy for students and teachers." Another professor made references to FM systems and their proper use in the classroom.

Ongoing experimental research

Some of the responses were not directly linked to the question asked. Nevertheless, these had implications for students with disabilities and covered issues such as the virtues and problems of voice recognition. Other issues included a discussion of ongoing experimental research such as studies with baroque music to facilitate and enhance language learning. Even a research project in Japan was mentioned, where a headset that works with a computer by using brainwaves is being developed.

Question 2

What new developments in computer, information and adaptive technologies do you see as likely to pose difficulties for people with disabilities?

The conversation became diverse and profuse in response to this question. There seemed to be a variety of problems attributed to computer technologies, most notably compatibility problems. Some of the problems discussed concerned technologies that aim to assist persons with visual impairments. For example, "in area of visual impairment there are difficulties with interfacing parts of visual/spatial programs," "also have difficulties getting a voice synthesiser to interface with other products - often conflict with other things on computers." One of the participants added, "although new video screens are great, they are useless for visually impaired."

One of the participants voiced his/her frustration towards technologies: "users need to be savvy and persistent. I think the average person finds this daunting." The participant implied that this would pose an even greater difficulty for persons with disabilities. One participant reported that, "software aimed at persons with learning disabilities is not user friendly. An example is that if (a) word is not spelled right, it makes a big mistake in commands." Someone commented that, "the information on the screen comes too fast. It would be good to slow down and make it more adaptable." Someone else suggested that touch tables used for the internet could also be made more adaptable.

Generally, everyone seemed to agree that compatibility and lack of appropriate adaptation of technologies create obstacles in an area that should be accessible to everyone.

Some of the professors in this focus group expressed concerns about professors' ability to find solutions to their students' problems. For example, it was noted that some students with learning disabilities might have a disadvantage in following the screen on the internet: "students do not or cannot read. Just click on what is underlined."

Question 3

What other resources could our research team call upon for relevant information?

Someone indicated that professors do not get adequate information about suitable computer technologies. This was followed by suggestions that professors be brought together to discuss this issue.

Participants also suggested that software/hardware companies should be made aware of compatibility problems and that they hold off creating new versions so that the software can become better integrated and more adapted.

Other software suggestions included that companies be informed of problems with the use of graphical user interfaces (i.e., how Windows can be improved for users with visual impairments). Furthermore, some participants suggested that programs which make use of spell checkers could be enhanced by integrating them with word prediction features.

Other Resources Mentioned

Some additional suggestions related to print media, television, and radio. Other suggestions revolved around contacting newsgroups. Furthermore, someone suggested e-mailing Bill Gates or meeting with the big software companies and exploring possible solutions. Other participants suggested that we consult computer clubs advertised in the computer section in the newspapers, as well as refer to relevant journals, the television show *Computer Chronicles*, and the radio show *Quirks & Quarks*.

Other participants suggested referring to web sites dealing with technologies and people with disabilities: "Trace Centre and Microsoft must also have a site regarding disability. There are companies that specialize in disability adaptation."

Finally, community resources such as university offices for students with disabilities were also mentioned as a source of information. Other suggestions included compiling a list of associations and finding out if they have any further information regarding technologies for people with disabilities, or consulting newsletters dealing with specific disabilities such as the Dyslexia Association, the Learning Disability Association, and the Multiple Sclerosis (MS) Society (many of which have Web Sites).

Question 4

What Prompted Your Interest In Our Research?

This question resulted in additional open discussion. It is treated here as a summary of this particular focus group's concerns.

Participants cited both personal experiences as well as professional interests which prompted them to attend this focus group. Some participants are professionals with disabilities themselves who see the benefits and pitfalls of technologies, both within their immediate environment as well as their student client environments. Other participants are non-disabled professors who feel the need for more innovative means to teach and work within the academic environment. All seemed to have a genuine interest in exploring the barriers that are created by new technologies and in sharing perceived solutions.

Summary

Responses in this group were so diverse that we did not feel that summarizing these was appropriate.

Focus Group #4

Professors

The final focus group consisted of four professors (two from universities and two from Cegeps) as well as a person who worked as a volunteer in a specialized school for children with disabilities. Most of the questions for this focus group were two-part questions which allowed for a diversity of responses, given that the participants were bringing with them diverse types of information.

Question 1

What personal experiences have you had, if any, in the use of computer, information and adaptive technologies with students with disabilities in your courses? What factors do you feel prevent or help access to these technologies?

There were discrepancies between the question posed and the responses provided. Answers were best divided as follows: issues mentioned by professors, attitudes, and experiences with technologies. Questions are available in Appendix 2.

Issues mentioned by professors

This incorporates both what hampers and what assists students with respect to technologies and access in general. Two professors spoke of the problem of access in general terms, "I come from an institution where access is limited (students with disabilities had to use freight elevators to get around). Access at our new building is better." Another was more specific with respect to classroom size: "(the) problem is with the size of our classrooms (44 students with one interpreter for a deaf student).

Attitudes

This refers to attitudes expressed either about students or technologies. Two instructors expressed similar attitudes with respect to students and technology. One professor felt strongly that, "anything that does the calculations for you is counterproductive." S/he continued that, "if they (students) can't master the material, then they're blocked for future courses." With respect to students with disabilities, this professor said that "if (students with disabilities) want to use it (computers) for word processing then it's fine." Another professor stated that s/he, "never had a student with a computer in class but usually I just give students with disabilities more time in exams."

Professors' attitudes and experiences with respect to students with disabilities ranged from: "we found that we should ask students what they need instead of waiting for them to approach us" to professors who stated that they had no experience teaching students with disabilities.

In general, professors in this group seemed casual about technology, indicating that they taught different students with different computer technologies: "in courses where students have lab time (we) encourage them to use it."

Experiences with technologies

Here, professors too interpreted "technologies" in a broader way. For example, one teacher spoke of audio/FM material used by students with hearing impairments: "anything that helps is good and vice versa."

Other professors enumerated specific problems with specific types of adaptive technologies. "Problem with visual/enlarging technologies is that these enlarge so big that (students) have to read letter by letter and end up forgetting the sentence they were reading, thus, making this technology counterproductive." Someone else added that, "although technology is a good way to access information, the students don't have the tools to evaluate what's legitimate on the net."

One professor preferred non-technological methods such as students using note takers while listening to the teacher instead of using a keyboard to take notes and one professor acknowledged that, "we rely on service providers and others for information on computer technologies."

Question 2

What advantages and disadvantages do you see that computer, information and adaptive technologies have for students with disabilities?

Professors' responses were similar to those expressed by the students. Answers to this question were divided into advantages and disadvantages. Some of the advantages cited by professors related to learning such as, "if we take technology as a practice, as a finite set of tools and something that people do, then it allows more diversity of styles of learning and more varied access points." This was followed by someone else focusing in further, "in classes where technology becomes integrated, it encourages more varied working styles."

With respect to the internet, one professor stated that, "in relation with connectivity, it (the internet) allows relations to be established without problems of proximity across cultures. We have classes where we teach students how to use the internet." Another professor added, "the internet might provide useful access and useful language changes in text/Braille/voice recognition, etc." As such, professors see that computers can be used to facilitate and provide the means to achieve long term goals.

Advantages

Two professors noted disability-specific adaptations as advantages: "access to information allows students with disabilities to become independent of others in acquiring information." "(Some students) can hook up the computer to a Braille printer."

A final word contributed by a professor who, looking at the long term well-being of all students, said, "we encourage students to use computers to get jobs."

Disadvantages

The disadvantages noted by professors were generally different in nature from those expressed by students. Nonetheless, there were two exceptions: " the cost of the technology and the lack of focus on student needs."

Other disadvantages noted by professors seem to appear as warnings about over-dependence: "as long as no calculations are made on computers (just use it to type) they're useful." One professor stated that s/he was "against use of computers with elementary courses, but later levels would be OK." Another expressed that: "there is a dependence on service providers. We need to close the gap between users and providers." Concerns regarding the internet were also expressed: "internet (in the) classroom can create segregation from classes - we want to encourage students to keep learning in a social context." Finally, one instructor suggested that "if you look at technology to provide all answers, they don't. They are tools (we should provide a shift in how they're conceptualised and applied)."

Question 3

What are new developments in computer, information and adaptive technologies in your discipline that are/ should be/ or could be useful to students with different disabilities? What potential benefits or limitations do you foresee with these computer, information, and adaptive technologies for students with disabilities?

Professors appeared conscious of various new developments in computer technologies in general and within their specific discipline. "New developments such as the connectivity 'revolution' (net interesting possibilities)," "also cognitive science developments in the use of technology (for example, math) - software is developed that allows students to make math manipulations with concrete and multiple representations," "allows mappings between the real world and the theoretical world." One professor repeated a concern expressed earlier: " (I) wonder about the segregation issue I would like to discuss the issue of what kind of classroom (if at all) should be used."

One of the participants asked for clarification regarding another professor's opinion (s/he did not see much use for technologies). This clarification is included here because the intervention was useful in prompting a participant to generate a different response. Although this professor originally said that s/he did not see any use for computer technologies by students with or without disabilities, when probed by the participant the "reluctant professor" agreed that, in effect, the computer information technology could be useful to students with disabilities in "small part."

Responses regarding benefits ranged from how the use of computers could facilitate the professor's tasks. "(The) real advantage to requiring all students to type is that it makes things much easier (no papers with 'whiteout')," "new developments in social sciences are the multiple uses of computer and statistics programs. Computers are useful in providing models (useful in social sciences - being able to play out the situation)."

Two instructors made disability specific comments: "we found voice input commands exciting - if you don't have manual dexterity it helps." Another had a question: "the internet - shift from DOS (text-based) work to visual Windows (GUI) - how does it impact the blind?" One professor added that voice and visuals are the new faces of technology and are important.

With respect to internet communication, one professor saw the following limitations: "if users don't understand on-line classes, for example the constraints when you're making a joke, you have to tell them it's a joke. Another limitation is that you've got to type fast or you get lost (if you don't have a lot of manual dexterity then it's harder to contribute) - IRC (Internet Relay Chat) has its own form of language to deal with this."

Question 4

What computer, information and adaptive technology services could the institution offer you to make teaching students with disabilities more effective?

Although professors provided different examples, they focused primarily on acquiring information: "teachers need more information on technology." Yet another added, "we should continue using the net as access to information and it should be used as a platform for people to discuss (teachers see the possibility of connecting with colleagues)," and "losing this sense of isolation that teachers with disabled students may feel allows people to share practices."

Others cited lack of time, a concern also noted by disability services providers: "as a teacher, there's not enough time to get used to new technology. There's no advance warning as to who is bringing what. Can we look at this new technology?"

Some professors made concrete suggestions concerning what they wanted to see: "the internet could be used as a discussion forum for new technologies," "correlation with colleges in similar situations - helps lower feeling of isolation."

Others told us about past or present experiences working with students. "How do I teach students? I've done it. It's doable. I had students that told me exactly what to do." Another said: "(you can) work right with the material on disk," yet another expressed that "it is helpful to have a demo of what students are using."

Two statements that reflect the changes in teacher-student roles and the novelty of technologies were: "we rely on students to tell us about the new technologies," and finally, "we train graduates to go to the workplace."

Open Discussion

The open discussion in this focus group encompassed many divergent topics. There were some direct questions that produced no responses. These were eliminated from consideration.

Some professors spoke generally about new types of relationships established on the internet: "new ways of experiencing relationships," and "for a lot of people it's a new way to express themselves and relate to others." This person made reference to "emoticons," smiling faces that are being created on the internet (by using punctuation symbols). Others felt that the internet would "remove the disability." Some instructors related personal experiences: "I spend time in chat rooms and have met some of the people face-to-face: it's interesting how they actually look. (It's) exciting to meet people that way."

Discussion also strayed into the area of how one should use technologies. One professor stated that, "computers are best used as typewriters in low-level math and science classes but it's important to recognize students with disabilities' ability to learn." Again, professors admitted that students often have more up-to-date knowledge of computer technologies than they do.

Another part of the discussion centered around the use of technologies and the role of professors: "if your objective is to make students memorize, then no teachers are needed. On the other hand, we are talking about new work organization (contact managers through e-mail)." One professor made a pivotal point in the dialogue by saying that, "I see it as a transition between classrooms versus learning on your own. Schools are likely to be different in their gathering techniques. We educate students to work in the workplace in a group setting (afraid segregation will affect this)."

Professors discussed the link between what they teach and the employment situation. "We should pay attention to how the work situation changes with new technology," "decisions we make are for the benefit of the students," and "computers enable companies to be displaced from Montreal...could be Europe, because distance doesn't matter anymore."

Like the other focus groups, this one provided the opportunity to share information about new computer technologies. This deliberation ranged from programs that collect databases to voice recognition. "Now there are programs to collect databases - it's not as labour intensive as long as content comes first and as long as students are still able to do the exercises." Furthermore, "the downside to voice recognition is that people have switched to it because of carpal tunnel syndrome and you have to keep your voice flat while speaking so the computer understands; (it is) straining on the voice. With the current programs, you have to keep your voice flat."

Summary

The professors' group was less focused than the service provider or student groups. The point of convergence proved to be the uses of technologies as teaching tools and the professor's role in the new "technological" academia. The professors' concern about role the of technologies resurfaced within the open discussion. Their views reflect general concerns about the uses of technologies in postsecondary education rather than focusing on disability related issues. Nonetheless, professors had a few items in common with personnel responsible for providing services to students with disabilities: lack of information, lack of time to pursue further learning, and the role of students in providing crucial information and knowledge about helpful computer technologies.

Analysis

Two distinctively different models of disability were applied to the analysis of these focus groups: the Environmental Factors Model (Whiteneck & Fougeyrollas, 1996) and the Social Model of Disability (Oliver, 1990). Although these models have different perspectives regarding the definition and identification of impairment and disabilities, as well as other elements dealing with locus of problems, both concur that it is environmental factors that create barriers towards achieving equity.

The Environmental Factors Model calls barriers created by the environment "handicapped situations." This model suggests that all environmental factors can either be determinants of barriers, such as printed material for people who are blind, or facilitators, such as printed material for people with hearing impairments. This model also explains that environmental factors can either be "facilitators" or "barriers" to people with disabilities (e.g., public address systems at airports are facilitators for people with visual impairments but can be barriers for people with hearing impairments). The Social Model refers to disabling environments that create barriers in society; all social, political, and environmental components of society that are not accessible can create disabling environments.

When reviewing the commonalties among all four focus groups, the most evident element is in the quasi-unanimous view that barriers are being created within the environment of computer and information technologies and that solutions need to be found while these technologies are still in the developing stage.

The following were issues mentioned as disadvantages by all four focus groups: cost of computer technologies, upgrades, and the need for training and/or retraining. Other issues raised by all four groups include concerns about the rapid changes of technology in software and hardware, the limitation of technologies in responding to the needs of users in general and users with disabilities in particular.

Students observed that policies create barriers in the acquisition of computer technologies. Nonetheless, a number of students stated that they lacked information about programs that could help them gain access to technologies. Personnel responsible for providing services to students with disabilities echoed this concern.

Students were explicit about the advantages and disadvantages of computer technologies for students with disabilities. Two elements must be noted. First, software that is useful for students with a specific type of impairment may, in fact, create barriers for students with a different impairment. For example, software that creates graphics is useful for students with learning disabilities, as these facilitate visual cues to learning. Yet, this same software can create barriers for students who are blind.

Second, students see software such as spell checkers useful in enhancing their performance and in improving the quality of their work. On the other hand, they see such tools as detracting from the actual learning process. Personnel responsible for providing services to students with disabilities, professors, and some members of the ragtag group also mentioned, in different ways, the freedom and the dependence that computer technologies can create. Zola (cited by Oliver, 1999) called this concern about reliance and dependence on technology the "over-technicalization of care". He was concerned that technology would overcompensate to the point of making people feel useless. It is evident that students and those working for and with them also recognize both the advantages and disadvantages of computer technologies.

Environmental factors have been implicated in denying people with disabilities goods and services as well as education. This view is consistent with Whiteneck and Fougeyrollas (1996). Participants in the student and service provider focus groups agreed that many present educational policies dealing with students with disabilities act as "barriers" rather than "facilitators" in determining access to education for students with disabilities. The main problems with policies arise from the fact that, as noted by Lemieux-Brassard (1996), there are discrepancies between the intent of the policies and how they are applied. These discrepancies can also be noticed within the implementation of educational policies. Present policies reflect the view that problems originate from within the individual rather than arising from the environment. The approach taken, therefore, is to try to remediate or to provide accommodation for individual impairments rather than locating the problem in the environment and then, prevailing upon the social structure to make systematic changes, as suggested by both the Social Model of Disability and the Environmental Factors Model (Oliver, 1990; Oliver, 1996; Swain, Finkelstein, French, & Oliver, 1996; Whiteneck & Fougeyrollas, 1996). Unless there is a shift away from this current ideology, students with disabilities will continue to be denied full access to postsecondary education because technologies will continue to be designed and built with inaccessible features. Arising primarily from the ragtag group but echoed by others, substantial effort must be undertaken to educate manufacturers of computer technologies as well as to formulate and implement strong laws to render technologies accessible.

Both student participants and personnel responsible for providing services to students with disabilities were more disability conscious in their understanding of problems with computer applications and in finding solutions to problems. Professor and ragtag participants were less disability focused. However, they seemed equally aware of the possibilities and advantages that computer and information technologies can provide to students with disabilities. In fact, participants in professor and student focus groups converged in describing the advantages of computer and information technologies for students with disabilities. The most notable of these is the belief that computers can create access to information, thereby allowing students with disabilities to become independent. Another issue that was touched upon in all focus groups is that new computer technologies appear to be changing the role of professionals working in academic institutions.

In conclusion, limitations in access to computer and information technologies was a central issue that was mentioned by all four groups. This is consistent with views promoted by both the Social Model of Disability (Oliver, 1990) as well as the Environmental Factors Model (Whiteneck & Fougeyrollas, 1996). In effect, the message seems to be that various groups should work together to provide better access. This includes industries that design and build software and hardware, policy makers who create laws regarding information technologies, and policy makers who plan programs which provide access to computer technologies for students with disabilities, administrators and "front line workers" who provide information to students with disabilities, and consumers with disabilities. These people all have a role in ensuring that computer technologies are accessible and affordable. If these issues are not considered and changes in existing procedures are not made, we will approach the next millennium with a technological society wherein people with disabilities will again be segregated by virtue of an inaccessible environment.

PHASE II: TELEPHONE INTERVIEW STUDY – METHOD AND FINDINGS

Overview

During the spring of 1998, two structured interview protocols were developed and administered by telephone and TDD (telecommunications device for the Deaf) to 37 Canadian college and university students and to 30 college and university personnel responsible for providing services to students with disabilities. Respondents were selected from colleges, universities, and postsecondary distance education institutions. All Canadian provinces and territories are represented. Where possible, both English and French institutions were sampled. Both computer users and non-users were interviewed. Interviews with students consisted of 17 sets of questions. Personnel responsible for providing services to students with disabilities were asked 18 sets of questions. Several of the questions posed to both groups were identical. Interviews typically lasted between 20 minutes and 1-1/2 hours. Participants came from 49 different Canadian postsecondary educational institutions.

Participants

Participants included 37 Canadian college and university students with various disabilities (20 females and 17 males) and 30 personnel responsible for providing services to students with disabilities (18 females and 12 males). Respondents came from 49 different institutions: 20 universities, 26 colleges, and three distance education institutions.

Our intent was to interview, by telephone, 32 postsecondary students with disabilities and 32 personnel responsible for providing services to students with disabilities from all 10 provinces, the two territories that existed at the time, and four postsecondary distance education institutions. Where possible, we avoided selecting students and service providers who were affiliated with the same institutions. We planned on 24 interviews in English and eight in French. English interviews were to represent one college and one university from each province (20), two interviews from colleges in the two territories, and two from distance education institutions (one from a university and one from a college). Of the eight interviews in French, four were expected in Quebec (one distance education and one non-distance education college and university respectively) and four from the provinces where Francophone postsecondary institutions with students who have disabilities were identified: Ontario, Manitoba, Nova Scotia, and New Brunswick. It should be noted that both territories have colleges but no universities and that there are four Canadian distance education institutions: one in British Columbia (a university-college), one in Alberta (university) and two in Quebec - one college and one university.

Students

In selecting students, we employed the following criteria:

- currently enrolled at a post-secondary institution or graduated or left school less than 12 months prior to the interview
- for each province, one student was to come from a college and one from a university (in Quebec this was duplicated to account for Anglophone and Francophone students)
- one student from each province had to be male and the other female
- one Francophone student from Ontario, Manitoba, Nova Scotia, and New Brunswick
- two male and two female distance education students (one English, one French)

We intended to interview 32 students fitting these criteria. In the final sample of 37, 29 of the participants fit the selection criteria. We were unable to recruit the three participants needed in the following categories: Francophone student in Nova Scotia, Francophone distance education college student, and English distance education university student. In addition, while we would have preferred an even balance between male and female distance education students, both distance education students in the final sample are female.

In the process of obtaining the sample, we interviewed eight "extra" students. This occurred for a variety of reasons including: cancelled but subsequently rescheduled appointments, availability of complete data from pretest participants, a deliberate attempt to secure interviews with non-users of computers (these students were difficult to find), and interviews arranged directly by personnel responsible for providing services to students with disabilities where we had no control over the sex of the respondent. While this upset the systematic sampling procedure, a larger more diverse sample of students appeared to warrant the decision to include the eight "extra" interviews in the sample.

Characteristics of the student sample

It can be seen in Table 1 that the composition of the final student sample of 37 (21 females, 16 males) is as follows. Sixteen of the participating students were enrolled at a college (12 females, 4 males), 19 at a university (7 females, 12 males), and 2 at distance education institutions (1 college, 1 university, both females). Six interviews were conducted in French (3 with females and 3 with males, including 3 outside Quebec and 1 from each of the following types of institutions in Quebec: college, university, distance education university). Thirty-one interviews were conducted in English (18 with females and 13 with males). Two of the interviews, both with females, were done using a TDD (telecommunications device for the Deaf). Ninety-five percent of participants were students at the time of the interview; the remainder had graduated or taken a leave during the previous year. The majority (73%) were enrolled on a full-time basis. Of the non-distance education students, 95% were attending school in the daytime. Almost half of the sample were pursuing a Bachelor's degree. Fourteen percent were pursuing a postgraduate degree, and the rest a certificate or diploma.

See Table 1

The average full time enrolment in institutions represented by students was 8400 (standard deviation = 9302, range = 138 to 38,792, median = 3743). The proportion of students with disabilities was 3.64% (standard deviation = 5.12, range = 0.09 to 17.05, median = 1.57). An equal number of students came from small (population under 100,000; n=12), medium (population between 100,000 and 1,000,000; n=12) and large (population over 1,000,000; n=13) cities.

Table 1

Demographics: Students

Variable	Whole Sample		University	College	Distance Education
Total Number Of Participants	37		19	16	2
Females	21	57%	7	12	2
Males	16	43%	12	4	0
Language					
English	31	84%	16	14	1
French	6	16%	3	2	1
Age					
Mean	29.26		27.53	30.41	36.50
Standard Deviation	10.61		9.34	12.07	10.61
Range	17-56		19-52	17-56	29-44
Duration Of Impairment					
Since Childhood (Age <10)	27	73%	13	13	1
In Between	7	19%	5	2	0
Acquired Recently (Past 5 Years)	3	8%	1	1	1
Pursuing					
Certificate/Diploma	15	41%	1	15	0
Bachelor's Degree[1]	17	46%	14	1	1
Post Graduate Degree	5	14%	4	0	1
Student Status I					
Full Time	27	73%	15	11	1
Part Time	10	27%	4	5	1
Student Status II					
Day Student	33	89%	18	15	0
Night Student	2	5%	1	1	0
Not Applicable	2	5%	0	0	2

[1] Yukon College offers courses that are transferable university level courses.

Mean age of students was 29 (standard deviation = 11, range = 17 to 56), with most (62%) falling into the 17 to 28 age range (see Table 1).

Students had a variety of impairments/disabilities: 41% had a visual impairment, 35% had a medical or psychiatric impairment, 32% had a learning disability [this includes attention deficit disorder (ADD/ADHD)], 32% had problems using their hands or arms, 22% had a hearing impairment, 22% had a mobility impairment, and 11% had a speech impairment. Half of the sample had multiple impairments. Indeed, the mean number of impairments was 1.86 per student (see Table 2). Approximately 3/4 of the sample had their disabilities since childhood (age less than 10), and only 8% had acquired their disability recently (past 5 years). Students in college and university programs were similar on these demographic attributes. Students were enrolled in a variety of programs: social sciences, commerce, physical and health sciences, education, literature, engineering, tourism, music, computer science, social work, counselling, library studies, law, nursing, funeral management, and athletics. The majority were enrolled in social science, commerce, and science programs. Overall, students in the present sample closely resemble postsecondary student samples in other investigations (Fichten, Goodrick, Tagalakis, Amsel, & Libman, 1990).

See Table 2

Personnel Responsible For Providing Services To Students With Disabilities

Our main task in selecting personnel responsible for providing services to students with disabilities was ensuring that they could provide us with the most global perspective possible concerning available services to students with disabilities at their institutions. For both English and French interviews we selected respondents from a directory published by the National Educational Association of Disabled Students (NEADS). To get the most comprehensive and diverse data possible an attempt was made to obtain respondents from colleges and universities other than those contacted to recruit students. This goal was accomplished in all but nine instances, although in three of these cases the individual responsible for providing services to students with disabilities was not involved in the selection of the students. In the remaining six instances where students and personnel responsible for providing services to students with disabilities were from the same institutions, there simply was no other choice (e.g., only 1 college in the Yukon Territory). In addition, we were unable to interview personnel responsible for providing services to students with disabilities from an Anglophone college in Manitoba, or from Francophone distance education or other institutions outside Quebec. Thus, 25 of the 30 participants fit the selection criteria. As in the case of students, five "extra" interviews are included in the final sample; this is because of cancelled but subsequently rescheduled appointments and pretest participants who provided complete data.

Characteristics of the personnel responsible for providing services to students with disabilities sample

It can be seen in Table 3 that the final sample of personnel responsible for providing services to students with disabilities consists of 30 individuals (18 females and 12 males). 14 of the participating individuals (7 females, 7 males) worked at a college, 13 in a university (9 females, 4 males), and 3 in distance education institutions (2 females, 1 male). Two interviews were conducted in French (1 female, 1 male) and 28 in English. The average official full time enrolment in institutions represented by personnel responsible for providing services to students with disabilities was 8890 (standard deviation = 8443, range 220 to 34,000, median = 7256). According to information provided to us, the mean proportion of students with disabilities was 1.97% (standard deviation = 3.11, range = 0.03 to 17.05, median = 1.45). Approximately equal numbers of personnel responsible for providing services to students with disabilities

Table 2

Descriptive Statistics: Students

Variable	# Of Students	% Of Students
Students' Disabilities		
Visual Impairment	15	41%
Totally Blind	6	16%
Low Vision	9	24%
Medical And Psychiatric Impairments	13	35%
Learning Disability	12	32%
Problems Using Arms Or Hands	12	32%
Mobility Impairment &/Or Wheelchair User	8	22%
Hearing Impairment	8	22%
Use Sign Language	2	5%
Use Oral Approach	6	16%
Speech Impairment	4	11%
Number Of Different Impairments Per Student		
1 Impairment	19	51%
2 Impairments	8	22%
3 Impairments	7	19%
4 Impairments	2	5%
5 Impairments	1	3%
Difficulties Operating Computer Components[1]		
Problems With Monitor	15	43%
Problems With Mouse	15	43%
Problems With Keyboard	8	23%
Problems With Diskette Manipulation	5	14%
Problems With Printer	3	9%
Problems With Payment For Computer Technologies[2]		
No Problem	18	53%
Some Problems	2	6%
Serious Problems	14	41%
Adequacy Of Available Help[1]		
Method Works Poorly	5	14%
Method Works Moderately Well	5	14%
Method Works Well	25	71%

[1] Only 35 of the 37 students used computers.

[2] Only 34 students had equipment at home.

came from small (population under 100,000; n=11), medium (population between 100,000 and 1,000,000; n=9), and large (population over 1,000,000; n=10) cities.

See Table 3

Procedure

Interviews were conducted during the spring of 1998. Interview questions were based on findings from Phase I of this project, i.e., the four focus groups. Student interview questions went through nine drafts and the questions designed for personnel responsible for providing services to students with disabilities went through ten drafts before being finalized. Interview protocol drafts were also examined by our Advisory Board as well as by members of our electronic discussion forum: Adaptech. In addition, the interview protocols were pretested on both English and French students and personnel responsible for providing services to students with disabilities .

After interviews were completed, participants were asked if they wished to obtain a copy of our report of the findings and, if so, to specify the format (e.g., large print, computer disk, audiotape). Reports were mailed to interested respondents in the fall of 1998.

To obtain information about the cities where respondents' educational institutions were located chambers of commerce, almanacs, and official web pages were consulted. For the purposes of the present investigation, cities and towns were grouped into three categories: small (population under 100,000), medium (population between 100,000 and 1,000,000), and large (population over 1,000,000).

Data concerning full time student enrolments were obtained from institutional web sites, from college and university registrar's offices, or departments of institutional analysis and research. The number of students with disabilities registered with the institution as having a disability and being eligible to receive services was provided by personnel responsible for providing services to students with disabilities.

Student Interviews

Interview questions

The final structured interview for students consisted of 17 groups of questions (see Appendix 4). Several items were identical to questions asked of personnel responsible for providing services to students with disabilities. Participants provided demographic information such as age and sex. They also provided information about their studies, including the type of educational institution they attend, qualifications pursued, and field of study. We asked about respondents' disabilities, the impact of the impairment/disability on performance as a student, whether students had difficulty using computer equipment such as a monitor, keyboard, printer and mouse, and whether they had problems handling diskettes. We also inquired about the types of computer, information and adaptive technologies used at home and at school. We asked questions about: how students obtained their computer technologies, how

Table 3

Demographics: College And University Personnel Responsible For Providing Services To Students With Disabilities

Variable	Whole Sample		University	College	Distance Education
Total Number Of Participants	30		13	14	3
Females	18	60%	9	7	2
Males	12	40%	4	7	1
Language					
English	28	93%	12	13	3
French	2	7%	1	1	0

they learned to use these, as well as about possible problems and solutions. Students also noted advantages and disadvantages, for them, of using computer technologies, indicated how they found out about new equipment and software that could help them, and specified their computer technology "wish list." Also, on a 10-point scale participants rated how often they used computers (frequency), how comfortable they were with computer technologies (comfort), and their level of expertise (expertise).

Participant recruitment

Participants were recruited through personal contacts, through our partner - the National Educational Association of Disabled Students (NEADS) - and through personnel responsible for providing services to students with disabilities. A team member contacted each student by telephone and scheduled an appointment convenient for the participant. In the case of NEADS members, to ensure confidentiality identifying information about potential participants was made available only to the research team member who is also a member of NEADS' executive. It was this individual who made the initial contact with these students.

In other instances, personnel responsible for providing services to students with disabilities asked potential participants for permission for a member of our research team to contact them. Similarly, permission for a team member to phone was obtained from students recruited through personal contacts. Once permission was obtained, a team member contacted the student to schedule an appointment. Prior to the interview students were informed about the goals of the project, their right to withdraw at any time without penalty, and the precautions taken to ensure confidentiality. If requested, a written consent form was provided (see Appendix 5). In addition, permission was sought to tape record interviews. Only two subjects indicated that they did not want to be tape recorded. Here, respondents' answers were written down by the interviewer. Similarly, responses were written down by the interviewer for a session conducted with the assistance of an intervener which lasted over 5 hours as well as in the single instance of equipment failure. When the interview was administered using a TDD (telecommunications device for the Deaf), a verbatim transcript of the interview was obtained.

The interviewer read each question and gave the respondent ample time to answer. Interview prompts built into the questions were used to obtain complete answers to the questions posed. No student refused to do the interview. Interviews lasted from 20 minutes to 1-1/2 hours. The intervener-assisted interview with the student who was deaf/blind and speech impaired lasted approximately five hours; this was conducted over a 2 day period.

Once interviews were completed, a written structured interview form was completed for each participant. Responses were quantified using predetermined categories wherever possible and entered into a spreadsheet for subsequent analysis.

Interviews With Personnel Responsible For Providing Services To Students With Disabilities

Interview questions

The final structured interview for personnel responsible for providing services to students with disabilities consisted of 18 groups of questions (see Appendix 6). Many of these were identical to questions asked of students. We asked participants for demographic information such as the name of their educational institution and job title. We inquired about the number of students with disabilities, including students with physical, psychiatric, and learning disabilities registered to receive services provided by the institution for students with disabilities during the past academic year. We also asked questions about the computer information and adaptive technologies at respondents' institutions for students with specific disabilities that were available at various locales on campus. We also asked about internet access on adapted work stations, the location of computers with adaptations, and the availability of a loan program. Participants answered questions about how specialized computer technologies are obtained at their institution, specific funding issues, and how they, the students, and the staff who oversee the specialized technologies learned to use the equipment. We also inquired about possible problems and solutions in these areas. Participants also specified how decisions about purchasing specialized computer technologies were made at their institution as well as about the hours of access to specialized computer technologies. Respondents indicated their beliefs about advantages and disadvantages of computer technologies for students with disabilities and stated their opinions about why some students choose not to use computer technologies. We also inquired about how respondents found out about new computer technologies that might be beneficial to students with disabilities and questioned participants about their technology "wish lists" for the office providing services to students with disabilities/specialized lab, the library, and other locations at their institution.

Participant recruitment

Potential participants were contacted and asked to volunteer. Only two individuals refused, citing time constraints. However, we were unable to schedule appointments with personnel responsible for providing services to students with disabilities in several categories due to problems with scheduling and unreturned phone calls. In most of these cases there was only one individual who could have fulfilled the selection criteria. For all others a time was scheduled for the interview.

At the scheduled time, participants were informed about the goals of the project, their right to withdraw at any time without penalty, and the precautions taken to ensure confidentiality. To encourage honest responses, even if these did not reflect well on the educational institution, participants were told that the information that they provide would never be linked either to themselves or to their educational institution. This was done because it is common in the field to publish descriptive "accessibility profiles" of educational institutions. If requested, a written consent form was provided (see Appendix 5). Respondents' permission was also sought to tape record interviews; all participants granted permission.

As was the case for students, here, too the interviewer read each question and gave the respondent ample time to answer. Interview prompts built into the questions were used to obtain complete answers to the questions posed. Interviews lasted from 20 minutes to 1-1/2 hours. In the case of one institution, the participant contacted asked that we obtain technical details from the adaptive technology specialist, which we did in a separate interview. Once interviews were completed, a written structured interview form was filled out for each participant. Responses were quantified using predetermined categories wherever possible and entered into a spreadsheet for analysis.

Results And Discussion

Proportion Of Students With Disabilities

There are great discrepancies among institutions in the percentage of students with disabilities. To better understand the reasons for this, we examined variables related to the proportion of students with disabilities. Where possible, we used data from all 49 different participating institutions (this includes institutions where we interviewed either students or personnel responsible for providing services to students with disabilities). It can be seen in Table 4 that approximately 1/3 of institutions were located in small, medium, and large cities.

See Table 4

According to available information, the average full time enrolment at the 49 participating institutions was 8136 (standard deviation = 9150, range = 138 to 38,792, median = 3743). These scores suggests that there were many small and a few very large institutions in our sample and that discrepancies among institutions were very substantial.

Information concerning the number of students with disabilities on campus is available for only 43 institutions. Data provided by personnel responsible for providing services to students with disabilities show that the mean percentage of students with disabilities at these institutions was 2.66% (standard deviation = 3.86, range = .03 to 17.05, median = 1.53). Thus, in most institutions fewer than 2% of students were registered to receive services provided by the institution for students with disabilities. Indeed, only 10 of the 43 institutions had more students than the mean.

Is size of city related to the percentage of students with disabilities?

One possible variable to affect the proportion of students with disabilities is the size of the city in which the institution is located. To examine this possibility, two types of analyses were undertaken. First, an analysis of variance (ANOVA) comparison was made using city size as the independent variable. Results and the means in Table 4 indicate that city size was not related to the proportion of students with disabilities, $F(2,40)=.78$, $p>.05$. The second type of analysis involved correlating city size and percentage of students with disabilities; the correlation coefficient, $r(41)= -0.139$, $p>.05$, also was nonsignificant. Thus, the answer to the question posed above is, "Definitely not."

Is size of the institution related to the percentage of students with disabilities?

Another variable which we thought may be related to the proportion of student with disabilities is the size of the institution. To answer the question posed above we correlated the percentage of students with disabilities with the total enrollment of the institution for the 43 participating institutions for which data were available. The nonsignificant Pearson product-moment correlation coefficient, $r(41)= -.218$, $p>.05$, indicates that the size of the institution is not related to the proportion of students with disabilities.

Table 4

Urban Regions Represented

Variable	Small City	Medium City	Large City
Cities Supplying Participants			
All 49 Institutions	41%	31%	29%
Institutions of Students	35%	32%	32%
Institutions of Personnel Responsible For Providing Services For Students With Disabilities	37%	30%	40%
% Students With Disabilities[1]			
Mean	3.54%	1.82%	2.63%
Standard Deviation	5.15	1.5	3.54

Note. 49 institutions overall. 37 students, 30 personnel responsible for providing services to students with disabilities.

[1] Data are available for 43 institutions.

Is type of institution related to the percentage of students with disabilities?

Colleges and universities may attract and host different student populations. Table 5 presents the data which answer the question, "Is type of institution related to the percentage of students with disabilities?". The ANOVA with 3 institution types (university, college, distance education) was not significant, $F(2,40)=1.80$, $p>.05$. Because the sample size of 3 for distance education may have distorted the ANOVA results, an independent samples t-test was conducted to compare scores in colleges and universities. Results show only a trend for colleges to host a larger proportion of students with disabilities than universities, $t(38)=1.90$, $p<.10$.

See Table 5

As for total numbers of students with disabilities, findings in Table 5 show that while enrollments in universities ($M = 12{,}437$) were significantly and substantially greater than in colleges ($M = 4{,}409$), $t(44) = 3.14$, $p<.01$, there was no significant difference between universities ($M = 201$) and colleges ($M = 118$) in the total number of students registered to receive services provided by the institution for students with disabilities, $t(38)=1.24$, $p>.05$. However, it is important to note the huge standard deviations evident in Table 5. It should also be noted that colleges in our sample did not have a uniform method of counting student enrolment.

Students' Experiences With Computer, Information And Adaptive Technologies

Is size of city related to students' experiences with computer, information and adaptive technologies?

We also wanted to ascertain whether institutions in cities of differing sizes provided different types of computer technology experiences for their students. ANOVA comparisons on students' self-rated frequency of computer use, $F(2,34)=.07$, $p>.05$, expertise, $F(2,32)= 2.48$, $p>.05$, and comfort, $F(2,32)=1.95$, $p>.05$, show no significant differences between students attending school in small, medium or large cities. Similarly, city size was not related significantly to problems with payment for computers used in one's home, $F(2,31)=.11$, $p > .05$, adequacy of learning method, $F(2,32)=1.36$, $p > .05$, or to adequacy of available help, $F(2,32)=.23$, $p > .05$. Correlational analyses reported in Table 6 support the ANOVA findings.

See Table 6

Age differences: students

We examined the relationship between student age and a host of variables of interest, including self ratings of Frequency, Expertise, and Comfort with computers. Pearson Product-moment correlation coefficients in Table 6 show no significant relationships.

Table 5

Students With Disabilities In Different Types Of Institutions

Variable	University	College	Distance Education
# Of Institutions	20	26	3
Full Time Enrollment			
Mean	12437	4409	11774
Standard Deviation	10160	7159	1709
Number Of Students With Disabilities[1]			
Mean	201	118	223
Standard Deviation	228	194	73
% Students With Disabilities[1]			
Mean	1.50%	3.82%	1.99%
Standard Deviation	1.11	5.22	0.94

[1] Only 43 institutions reported on the number of students with disabilities: 19 universities, 21 colleges, 3 distance education institutions.

Table 6

Correlations Among Selected Variables: Students

Variable	Age	Disability Related	Self-Ratings Computer Use			How Well Things Work			City And Institution Factors			
		# Of Impairments	Frequency	Expertise	Comfort	Problems With Payment For Computers	Adequacy Of Learning Method	Adequacy Of Available Help	Full Time Enrollment	City Size	# Students With Disabilities	% Students With Disabilities
Age		0.169	-0.031	-0.040	-0.107	0.251	-0.211	-0.192	0.088	-0.084	-0.022	0.328
# Of Impairments	0.169		0.103	0.018	-0.135	**.374(*)**	**-.377(*)**	-0.314	0.311	-0.127	0.181	-0.321
Frequency	-0.031	0.103		**.406(*)**	**.356(*)**	0.226	0.134	0.057	-0.024	0.027	0.001	0.110
Expertise	-0.040	0.018	**.406(*)**		**.877(**)**	-0.007	**.360(*)**	0.200	0.210	0.056	0.047	-0.100
Comfort	-0.107	-0.135	**.356(*)**	**.877(**)**		-0.060	0.270	0.146	0.196	0.035	0.043	-0.037
Problems With Payment For Computers	0.251	**.374(*)**	0.226	-0.007	-0.060		**-.395(*)**	**-.447(**)**	0.175	0.070	0.071	-0.113
Adequacy Of Learning Method	-0.211	**-.377(*)**	0.134	**.360(*)**	0.270	**-.395(*)**		**.551(**)**	-0.227	-0.127	-0.298	-0.013
Adequacy Of Available Help	-0.192	-0.314	0.057	0.200	0.146	**-.447(**)**	**.551(**)**		-0.204	-0.069	-0.219	-0.242
Full Time Enrollment	0.088	0.311	-0.024	0.210	0.196	0.175	-0.227	-0.204		**.497(**)**	**.567(**)**	-0.343
City Size	-0.084	-0.127	0.027	0.056	0.035	0.070	-0.127	-0.069	**.497(**)**		**.512(**)**	-0.294
# Students With Disabilities	-0.022	0.181	0.001	0.047	0.043	0.071	-0.298	-0.219	**.567(**)**	**.512(**)**		0.220
% Students With Disabilities	0.328	-0.321	0.110	-0.100	-0.037	-0.113	-0.013	-0.242	-0.343	-0.294	0.220	

* $p < .05$

** $p < .01$

Bold coefficients are significant.

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Sex differences: students

To evaluate differences between the 21 female and 16 male students a series of independent t-tests were made on the following variables: number of impairments, frequency, expertise, and comfort using computers, problems with payment for computers, adequacy of learning method, and adequacy of available help. Means and test results in Table 7 show that computers are used reasonably frequently by participants (mean = 8.11 on a 10-point scale), that respondents in the sample who use computers are reasonably comfortable with computers (mean = 7.41 on a 10-point scale) and that they consider themselves to be well experienced (mean = 6.65 on a 10-point scale). There were no significant differences between male and female students. Indeed, the only variable which even approached significance was comfort using computers; this suggests that males may be more comfortable using computers than females.

See Table 7

How Does The Number Of Students' Impairments Relate To Their Experiences With Computer, Information And Adaptive Technologies?

A series of Pearson product-moment correlation coefficients were computed to examine relationships between disability related factors, such as the number of impairments, self-ratings of frequency of computer use, expertise and comfort, evaluations of how well things work with payment for computers, adequacy of learning method, and adequacy of available help with computer technologies when needed, as well as city and institution factors such as the size of the educational institution, the size of the city in which it is located, the total number of students with disabilities and the percentage of students with disabilities on campus.

Correlation coefficients in Table 6 show that students with more impairments reported significantly more problems paying for computer technologies as well as more difficulty learning to use computer, information and adaptive technologies than students who had fewer impairments. Not surprisingly, frequency of computer use, expertise and comfort with computer technologies were all highly related to one another, with the strongest relationship, $r(33)=.88$, $p<.01$, being between self rated expertise and comfort. Similarly, ratings of problems with payment for computers, adequacy of learning method, and adequacy of available help were also significantly related. Also, it came as no surprise that city size, total full time enrolment and number of students with disabilities are all correlated significantly, although none of the correlations with the percentage of students with disabilities is significant.

Do Students Who Use Assistive Aids Take More Readily to Computer Technologies?

To answer this question we compared students who indicated that they used assistive devices other than computers (such as four track tape recorders, FM systems, dictaphone, telecommunications device for the Deaf) to those who did not on the variables of interest. It can be seen in Table 8 that of the 6 comparisons, only one was significant (adequacy of learning method); this shows that students who use other assistive devices indicated more problems learning to use computer technologies than those who

Table 7

Sex Differences: Students

Variable	Sex	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Age	Female	21	29.12	10.92	-0.09	35	0.93
	Male	16	29.44	10.53			
Frequency Using Computers[1]	Female	21	7.67	2.92	-1.18	35	0.25
	Male	16	8.69	2.12			
Expertise With Computers[1]	Female	19	6.16	2.14	-1.37	33	0.18
	Male	16	7.22	2.46			
Comfort With Computers[1]	Female	19	6.74	2.33	-1.80	33	0.08
	Male	16	8.19	2.43			
Problems With Payment For Computers[2]	Female	19	0.39	0.49	-0.62	32	0.54
	Male	15	0.50	0.50			
Adequacy Of Learning Method[3]	Female	19	0.74	0.31	-0.37	33	0.72
	Male	16	0.78	0.41			
Adequacy Of Available Help[3]	Female	19	0.79	0.38	0.07	33	0.95
	Male	16	0.78	0.36			
# Of Impairments	Female	21	2.00	0.95	0.87	35	0.39
	Male	16	1.69	1.25			

[1] 10 point rating scale, with higher scores indicating greater comfort, frequency and expertise.

[2] Higher scores indicate more problems

[3] Higher scores indicate better outcomes

did not use other assistive devices. One of the six comparisons approached significance (expertise), suggesting that people with prior experience using other assistive devices consider themselves more skilled with computers than do people who do not use other assistive devices.

See Table 8

How Do Students' Disabilities Affect Their Activities And Performance At School?

Thirty of the 37 participants (81%) indicated that their disability affects their activities or performance at school. How these are affected are best described in the words of the students themselves (see Appendix 7).

Difficulties Students Have Operating Computer Components

Almost half of the sample (43%) had difficulties with the monitor as well as with the mouse. In addition, a substantial number of students had problems with the keyboard, with diskette manipulation and with the printer. Details are available in Table 2.

Equipment For Students With Disabilities

Responses of personnel responsible for providing services to students with disabilities concerning the impairments of students at their institutions are reported in Table 9. These indicate that almost all institutions had students with hearing, learning, visual and neuromuscular impairments. However, fewer institutions had students with more severe impairments. For example fewer institutions had students who were blind than students with low vision, who used sign language rather than the oral approach, or who had problems using their hands or arms than students with mobility impairments. 83% of institutions had some specialized computer equipment for their students with disabilities.

See Table 9

Table 9 also shows that while only 63% of institutions reported having students who are totally blind, the lowest number in Table 9, 84% of these, the highest number, reported having specialized computer, information and adaptive technologies for them. Institutions were also likely to have specialized computer equipment for their students with low vision (81%). Most institutions (between 62% and 75%) also reported having specialized computer technologies for their students with learning, mobility, and neuromuscular impairments. When it came to students with hearing impairments, however, while 97% of institutions reported having students with this disability, less than 1/3 reported that they had any specialized computer equipment for these students.

What Kinds Of Equipment Do Students With Different Disabilities Use?

The listing that follows indicates the types of equipment often used by students with specific disabilities.

Table 8

Student Users And Non-Users Of Assistive Devices

Variable	Use Other Assistive Devices	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Frequency Using Computers[1]	No	17	8.00	2.00	-0.23	35	0.821
	Yes	20	8.20	3.11			
Expertise With Computers[1]	No	17	5.91	2.14	-1.88	33	0.069
	Yes	18	7.33	2.33			
Comfort With Computers[1]	No	17	6.82	2.63	-1.37	33	0.180
	Yes	18	7.94	2.21			
Problems With Payment For Computers[2]	No	16	0.38	0.50	-0.74	32	0.465
	Yes	18	0.50	0.49			
Adequacy Of Learning Method[3]	No	17	0.88	0.22	2.195	33	0.037
	Yes	18	0.64	0.41			
Adequacy Of Available Help[3]	No	17	0.82	0.35	0.583	33	0.564
	Yes	18	0.75	0.39			

[1] 10 point rating scale, with higher scores indicating greater comfort, frequency and expertise.

[2] Higher scores indicate more problems

[3] Higher scores indicate better outcomes

Table 9

Descriptions Of Institutional Considerations: Personnel Responsible For Providing Services To Students With Disabilities

Disability	# Of Institutions With Students Who Have This Disability	% Of Institutions With Students Who Have This Disability	# Of Institutions With Specialized Computer Equipment For Their Students	% Of Institutions With Specialized Computer Equipment For Their Students
Visual Impairment	26	87%	21	81%
Totally Blind	19	63%	16	84%
Low Vision	26	87%	21	81%
Learning Disability	28	93%	21	75%
Mobility And Neuromuscular Impairments	26	87%	19	73%
Problems Using Arms Or Hands	23	77%	18	78%
Mobility Impairment &/Or Wheelchair User	26	87%	16	62%
Hearing Impairment	29	97%	7	24%
Use Sign Language	22	73%	7	32%
Use Oral Approach	27	90%	4	15%
Other Impairments	22	73%	5	23%

Illustration 1

Equipment For Students Who Are Blind

Voice
- *Voice synthesizer (hardware) (e.g., DECTalk)*
- *Screen reader (software that offers a range of sophisticated features such as reading of menu bars/icons and the ability to program what portion of the screen is to be read depending on such things as the appearance of text written in specific colors, e.g.; Jaws, Artic)*
- *Document reader (text-to-speech software that reads text and the contents of the clipboard; e.g., ReadToMe, TextAssist)*

Scanner Hardware and Software
- *Scanning software (specialized and mainstream; e.g., OpenBook, OmniPage)*
- *Standalone reading machine (e.g., Kurzweil Personal Reader)*

Software
- *Text based browser and e-mail (e.g., Pine, Lynx)*
- *Specialized math software*

Braille
- *Braille translation software (converts text into Braille code and formats text for printing in Braille; e.g., Duxbury)*
- *Braille printer (e.g., VersaPoint)*
- *Refreshable Braille display (gives a one line Braille display of what is on the screen; e.g., Navigator)*

Portable
- *Braille 'n Speak (portable note taking device with a Braille keyboard and speech output)*
- *Type 'n Speak (portable note taking device with a QWERTY keyboard and speech output)*

Mouse Control
- *Voice activated mouse*

---

* 84% of institutions (16/19) which have students with this disability have specialized equipment for them.
* 50% of students use DOS based software exclusively.

Illustration 2

Equipment For Students Who Have Low Vision

Voice

- *Screen reader (software that offers a range of sophisticated features such as reading of menu bars/icons and the ability to program what portion of the screen is to be read depending on such things as the appearance of text written in specific colors; e.g., Jaws, Artic)*
- *Document reader (text-to-speech software that reads text and the contents of the clipboard; e.g., ReadToMe, Text Assist)*

Scanner Hardware and Software

- *Scanning software (specialized and mainstream; e.g., OpenBook, OmniPage)*
- *Standalone reading machine (Kurzweil Personal Reader)*

Software

- *Document manager program (e.g., PagisPro)*

Monitor

- *Large*
- *Visors and masks to cut glare*

Magnification

- *Screen magnification software (e.g., ZoomText, LP-Windows)*

Software

- *CD-ROM encyclopedia*

Portable

- *Type 'n Speak (portable note taking device with a QWERTY keyboard and speech output)*
- *Laptop*

Other

- *Voice control of menus and toolbars: eyes-free and hands-free dictation (e.g., Dragon Dictate Classic Edition, Kurzweil Voice Pad)*
- *Control of display through built-in features of software (e.g., zoom, font size, font and background color)*

---

* 81% of institutions (21/26) which have students with this disability have specialized equipment for them.
* Some of these students can use the equipment used by students who are blind.

Illustration 3

Equipment For Students with Hearing Impairments

Software

- *Spell check (usually built into word processors)*
- *Grammar check (usually built into word processors)*
- *Word prediction software (e.g., TextHelp!, Co-Writer)*
- *Built-in accessibility features such as visual flash (instead of sounds)*
- *Encyclopedia on CD-ROM*
- *Subtitles/captions where available*
- *E-mail and chat programs (instead of the telephone)*

Portable

- *C-Note system (note taking system involving 2 joined laptops)*

Other

- *Control of display through built-in features of software and operating system (e.g., visual flash instead of sounds)*

---

* 24% of institutions (7/29) which have students with this disability have specialized equipment for them.

Illustration 4

Equipment For Students With a Learning Disability

Voice

- *Screen reader (software that offers a range of sophisticated features such as reading of menu bars/icons and the ability to program what portion of the screen is to be read depending on such things as the appearance of text written in specific colors; e.g., Jaws, Artic)*
- *Document reader (text-to-speech software that reads text and the contents of the clipboard; e.g., ReadToMe, TextAssist)*

Dictation Program

- *Voice recognition software (e.g., Dragon Naturally Speaking, ViaVoice)*

Scanner Hardware and Software

- *Scanning software (specialized and mainstream; e.g., OpenBook, OmniPage)*
- *Standalone reading machine (e.g., Kurzweil Personal Reader)*

Magnification and Display Control

- *Large screen monitor*
- *Control of display through built-in features of software (e.g., zoom, font size, font, highlight and background color)*

Software

- *Document manager program (e.g., PagisPro)*
- *Spelling and grammar check (usually built into word processors)*
- *Word prediction software (e.g., TextHelp!, Co-Writer)*
- *Electronic dictionary and encyclopedia on CD-ROM*
- *Literacy software (e.g., Plato)*
- *Tutorials: grammar, math, typing*
- *Flow charting concept mapping software (e.g., Inspiration)*

Portable

- *Franklin language master and spell checker*
- *Laptop*
- *Alphasmart (portable note taking device)*

---

* 75% of institutions (21/28) which have students with this disability have specialized equipment for them.
* Some of these students can use the equipment used by students who are blind, have low vision or a hearing impairment.

Illustration 5

Equipment For Students With Mobility and Hand/Arm Impairments

Ergonomic
- *Adjustable work station (both manual and electronic)*
- *Desk and chair height and angles adjustable*
- *Accessible study carrel*
- *Ergonomic chair*
- *Adjustable keyboard location and angle*
- *Monitor and PC can be raised, rotated or lowered*
- *Document stand (to hold documents to be typed)*

Keyboard
- *Sticky keys (built-in software to allow one keystroke use of keys that require Shift, Control, CapsLock, etc.)*
- *Software to allow for one handed typing*
- *Keyguard (to prevent hitting 2 keys at the same time.)*
- *Splints*
- *Wrist rests*
- *Key repeat adjustments (built in software that instructs the keyboard to ignore accidental or repeated keystrokes, e.g., FilterKeys)*

Mouse
- *Joystick type mouse*
- *Trackball*
- *Touch pad*
- *Ergonomic mouse*
- *Head mouse*

Voice Input and PC Control
- *Voice control of menus and toolbars: eyes-free and hands-free dictation (e.g., Dragon Dictate Classic Edition, Kurzweil Voice Pad)*
- *Voice recognition (dictation) software (e.g., Dragon Naturally Speaking, ViaVoice)*

Alternate Input Devices
- *Sip and puff (hardware and software system to give computer commands by blowing or sucking through a straw-like device)*
- *Mouth wand (chop-stick like rod with rubberized tip for typing using one's mouth)*
- *Morse input hardware and software*

Scanner Hardware and Software
- *Scanner (e.g., ScanJet)*
- *Optical character recognition (OCR) software (e.g., TextBridge, OmniPage)*

Monitor and Image
- *LCD projector (e.g., Proxima)*

Software
- *Word prediction software (e.g., TextHelp!, Co-Writer)*
- *E-mail account*

Portable
- *Franklin language master and spell checker*
- *Laptop*
- *Alphasmart (portable note taking device)*

---

* 73% of institutions (19/26) which have students with this disability have specialized equipment for them.

Illustration 6

Equipment For Other Students with Disabilities

It should be noted that 22 of the 30 personnel responsible for providing services to students with disabilities (73%) indicated that they had students with disabilities who did not fit into these categories. Most indicated that they used whatever equipment was available to assist these students. What is particularly noteworthy is that one person providing services to students with disabilities indicated that because of the equipment available in the specialized lab, he or she was able to provide computer support services to foreign language students. This suggests that equipment which is of use to students with disabilities is not only useful to them, but also to other groups of students served by postsecondary institutions.

Students with the following impairments/disabilities/conditions were reported by personnel responsible for providing services to students with disabilities.

- *Language disorders: aphasia, speech impairment*
- *Medical disabilities/chronic health problems: arthritis, back problems, Chron's disease, chronic pain, diabetes, Dystonia, Grave's disease, lupus, multiple sclerosis, narcolepsy*
- *Neurological conditions: brain injuries, stroke, epilepsy*
- *Psychiatric/psychological disabilities: anxiety disorders, mood disorders, exam anxiety, bipolar disorder, obsessive compulsive disorder, schizophrenia, dissociative disorders, eating disorders, personality disorders, Asperger's syndrome, autism, alcoholism*
- *Temporary disabilities/impairments/conditions: physical injuries through accidents, stress, acute back injuries, pregnancy*

Are There Non Computer User Students Who Could Benefit From Using Computer, Information And Adaptive Technologies?

Ninety percent of personnel responsible for providing services to students with disabilities indicated that there were students on their campuses who could have benefited form computer, information and adaptive technologies but who were not using these. It can be seen in Table 10 that that the most popular reason, given by 2/3 of respondents, was lack of comfort with computers. Other reasons provided by at least 20% of respondents were: cost, lack of awareness about what equipment is available, time, concerns about looking different from other students, and poor skills.

See Table 10

What Kinds Of Institutions Have No Specialized Computer Technologies?

Data provided by personnel responsible for providing services to students with disabilities indicate that all universities represented in the sample have computer, information and adaptive technologies for their students. However, only 79% of colleges have equipment; colleges with few students with disabilities are the ones most likely to have no equipment for their students. Only one of the three distance education institutions reported having equipment.

Data presented in Table 11 indicate that universities, which generally have higher enrollments than colleges, also have a significantly more diverse population of students with disabilities. Thus, it was not surprising to find that universities also have significantly more specialized equipment than do colleges.

See Table 11

Institutions Which Do Have Computer, Information And Adaptive Technologies

Correlates of good institutional computer, information and adaptive technologies

Significant correlation coefficients presented in Table 12 show that larger educational institutions have more students with disabilities (but the proportion of their students with disabilities is not different) and more specialized equipment for them.

See Table 12

Table 10

Personnel Responsible For Providing Services To Students With Disabilities' Beliefs About Why Some Students Who Could Benefit From Computer Technologies Fail To Use Them

Beliefs	# Of Disability Service Providers Indicating This	% Of Responses	% Of Disability Service Providers Indicating This
Fear, intimidation, discomfort, frustration, lack of confidence, belief one cannot learn	20	32%	67%
Not aware of what is available	7	11%	23%
Cost and funding considerations	6	10%	20%
Time	6	10%	20%
Students don't want to look different, stand out, fear disclosing they have a disability	6	10%	20%
Poor skills, poorly motivated, not technically included	6	10%	20%
Lack of training opportunities	4	6%	13%
Lack of understanding of the benefits	3	5%	10%
Complexity of systems, having to stay current	2	3%	7%
Ethnicity, cultural and geographic background, age	2	3%	7%
Preference for dictating	1	2%	3%

Note. Only one response per participant is counted in each category. Mean number of responses per participant = 2.97. 90% of participants responded to this question.

Table11

Differences Between Colleges And Universities: Personnel Responsible For Providing Services To Students With Disabilities

Variable	Institution	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Centralization	University	12	0.50	0.52	0.24	19	0.813
	College	9	0.44	0.53			
Problems With Funding	University	12	0.54	0.50	-1.13	19	0.274
	College	9	0.78	0.44			
Service Provider's Learning Method Works Well	University	12	0.67	0.25	-0.84	19	0.413
	College	9	0.78	0.36			
Student Learning Method Works Well	University	11	0.68	0.46	-0.23	18	0.819
	College	9	0.72	0.26			
Types Of Students	University	13	5.00	1.78	2.54	25	0.018
	College	14	2.86	2.51			
Specialized Equipment	University	13	7.23	1.17	2.09	25	0.047
	College	14	5.71	2.37			

Table 12

Correlations Among Selected Variables: Personnel Responsible For Providing Services To Students With Disabilities' Responses

Variable	How Well Things Work		Diversity		City And Institution Factors			
	Adequacy: Service Provider's Learning Method	Adequacy: Students' Learning Method	Diversity of Students	Specialized Equipment	Full Time Enrollment	City Size	# Students With Disabilities	% Students With Disabilities
Adequacy: Service Provider's Learning Method		-0.028	-0.047	-0.205	-0.063	-0.041	**-.418(*)**	0.044
Adequacy: Students' Learning Method	-0.028		0.010	-0.030	0.053	0.045	-0.070	0.138
Diversity Of Students	-0.047	0.010		**0.623(**)**	**0.520(**)**	0.287	**0.485(**)**	0.226
Specialized Equipment	-0.205	-0.030	**0.623(**)**		**0.490(**)**	**0.439(*)**	**0.560(**)**	0.220
Full Time Enrollment	-0.063	0.053	**0.520(**)**	**0.490(**)**		**0.612(**)**	**0.603(**)**	-0.195
City Size	-0.041	0.045	0.287	**0.439(*)**	**0.612(**)**		**0.393(*)**	-0.227
# Students With Disabilities	**-0.418(*)**	-0.070	**0.485(**)**	**0.560(**)**	**0.603(**)**	**0.393(*)**		0.255
% Students With Disabilities	0.044	0.138	0.226	0.220	-0.195	-0.227	0.255	

* $p < .05$

** $p < .01$

Bold items denote significant coefficients.

Paying for computer technologies located at universities and colleges

Of the 25 participants who responded to this question, most indicated that provincial programs funded their equipment. This was closely followed by regular institutional funds. Other sources can be seen in Table 13.

See Table 13

It can be seen in Table 14 that most personnel responsible for providing services to students with disabilities are experiencing problems with funding for computer, information and adaptive technologies. A non significant t-test indicates that this is equally true of male and female service providers, $t(20)=.25$, $p>.05$.

See Table 14

How are purchase decisions made?

Personnel responsible for providing services to students with disabilities indicated that most purchase decisions are made by the office for students with disabilities after informal consultation with staff and students (71%). Only about 1/3 (29%) of institutions make purchase decisions after broad-based consultation (i.e., intersectorial committees including students, computing services, audio-visual, the library, learning center, physical plant representatives, faculty, student affairs, and adaptive technologists).

Where is adapted computer equipment located?

Of those persons responsible for providing services to students with disabilities who indicated that they had equipment for their students, approximately 1/2 (52%) indicated that this was centralized in one main location while the remaining half (48%) indicated that the equipment was decentralized (e.g., located in the library, in mainstream computer labs).

Does the institution have a loan program for computer information and adaptive technologies?

Again, half of the personnel responsible for providing services to students with disabilities (50%) indicated that they had a loan program. There is no single model for loan programs. Duration of loans varies from, "a few hours or a day" to "duration of their studies." Most service providers indicated that equipment loans are flexible and based on individual need and availability of equipment. Generally, the loan is for a short (1-4 week) period for. This is typically for a specific activity or for temporary replacement of students' own equipment (e.g., when waiting for an agency to provide approved equipment or when equipment is being repaired).

How available is adapted computer equipment?

All institutions which have equipment make this available to students during business hours, including lunch time. The vast majority (90%) also provide access to equipment during the evening, and 81% provide weekend access.

Table 13

Who Pays For Computer Technologies Located In Offices Providing Services For Students With Disabilities/Specialized Labs?

Beliefs	# Of Responses	% Of Responses	% Of Service Providers
Provincial Programs	9	21%	36%
Institutional Funds	8	19%	32%
Federal Programs	4	9%	16%
Foundations	4	9%	16%
Office For Students With Disabilities	3	7%	12%
Other Sources	15	35%	60%

Note. Only one response per person responsible for providing services to students with disabilities is counted in each category. 25 participants responded to this question.

Table 14

Concerns Of Personnel Responsible For Providing Services To Students With Disabilities

Issues	% Of Service Providers
Problems With Funding For Computers [1]	
No Problem	29%
Some Problems	5%
Serious Problems	67%
Adequacy Of Learning Method For Disability Service Providers [2]	
Method Works Poorly	4%
Method Works Moderately Well	48%
Method Works Well	48%

[1] Only 25 institutions reported having any type of specialized equipment.

[2] Only 23 institutions responded to this question.

How available is the internet?

All institutions surveyed have internet access. However, only 54% have adapted computers with internet capability. This is an important issue for students with all types of disabilities.

Learning To Use Computer, Information And Adaptive Technologies

Students

It can be seen in Table 15 that most students learned to use computer technologies by themselves or through mainstream courses. Personnel responsible for providing services to students with disabilities, however, believed that students learned from an adaptive technology trainer or from personnel responsible for providing services to students with disabilities. It is evident both from these data, as well as from the nonsignificant results when students' and service providers' responses were correlated, $r(4) = -.06$, $p > .05$, that these two groups do not agree on how students learn to use computer technologies. This is likely due to service providers focusing mainly on those students who use adaptive, rather than mainstream technologies.

See Table 15

As the data in Table 15 indicate, most students felt that their method of learning works reasonably well. Only 11% of students indicated that it worked poorly. Personnel responsible for providing services to students with disabilities concurred with this evaluation.

Personnel responsible for providing services to students with disabilities

24 personnel responsible for providing services to students with disabilities responded to this question. It can be seen in Table 16 that most indicated at least two different modalities of learning, with 75% of respondents indicating that they are at least partially self taught and 50% indicating that they learned from an adaptive technology trainer. Learning from the students was also mentioned by a substantial number of respondents (21%).

See Table 16

As the data in Table 14 indicate, most personnel responsible for providing services to students with disabilities felt that their method of learning works reasonably well. A non significant t-test shows that male and female respondents did not differ in this regard, $t(21)=1.42$, $p>.05$. The significant correlation coefficient in Table 12 reveals that service providers were more likely to indicate that their method of learning worked poorly if their institutions hosted more students with disabilities.

Table 15

How Do Students Learn To Use Computer Technologies?

	Students' Responses			Personnel Responsible For Providing Services To Students With Disabilities' Beliefs[1]		
Variable	# Of Students Who Indicated This	% Of Student Responses	% Of Students Who Indicated This	# Of Disability Service Providers Who Believed This About Students	% Of Disability Service Provider Responses	% Of Disability Service Providers Who Believed This About Students
How Learned[1]						
Self Taught	28	38%	80%	8	17%	33%
Mainstream Course	18	25%	51%	6	13%	25%
Adaptive Technology Trainer	12	16%	34%	14	29%	58%
Friends/Family	9	12%	26%	3	6%	13%
Disability Service Provider	1	1%	3%	9	19%	38%
Other	5	7%	14%	8	17%	33%
Adequacy Of Learning Method For Students[2]						
Method Works Poorly	4		11%	4		18%
Method Works Moderately Well	9		26%	6		27%
Method Works Well	22		63%	12		55%

[1] 35 students and 24 persons responsible for providing services to students with disabilities responded to this question.

[2] 35 students and 22 persons responsible for providing services to students with disabilities responded to this question.

Table 16

How Do Personnel Responsible For Providing Services To Students With Disabilities Learn To Use Computer, Information And Adaptive Technologies?

How Learned	# Of Responses	% Of Responses	% Of Service Providers
Self Taught	18	37%	75%
Adaptive Technology Trainer	12	24%	50%
Students	5	10%	21%
Mainstream Courses	1	2%	4%
Friends/Family	0	0%	0%
Other	13	27%	54%

Where Do Students Use Their Computer Technologies?

Thirty five of the 37 student participants (95%) indicated that they used a computer. As can be seen in Table 17, most students use computers both at home and at school. Slightly less than half of the students indicated that they used a computer in the library.

See Table 17

A substantial number of students, 80% of computer users, use the internet. Most internet users access the web from home, although many use the institutional connections as well. Internet access through the library was reported only by a small number of students (see Table 16).

How Do Students Pay For Their Computer Technologies?

Approximately half of the students indicated that paying for their computer technologies was problematic (see Table 2). Indeed, of the 30 students who indicated that they use a computer at home, 27 (90%) indicated that either they themselves or their families paid for most of the equipment. A little more than half (N = 17) of the student sample indicated that they benefited from a government grant. A third of the students (N = 9) had some or all of their equipment purchased or loaned by their postsecondary educational institution (mostly internet access from home). 10% of students (N = 3) had equipment donated by a foundation or organization, and 2 students had equipment given to them by friends.

What Are The Advantages And Disadvantages Of Using Computers For Students With Disabilities?

It should be noted that in response to the question about advantages and disadvantages of computer use, all 35 computer users indicated advantages. When it came to disadvantages, however, 6 students indicated that they experienced no disadvantages. Similarly, all 30 personnel responsible for providing services to students with disabilities indicated advantages. However, 2 of them stated that there were no disadvantages.

Advantages

The advantages of computer, information and adaptive technologies noted by students and personnel responsible for providing services to students with disabilities are listed in Table 18. These show that there is good agreement between students and personnel responsible for providing services to students with disabilities that word processing eliminates the nead to handwrite and results in neat presentations, that computer technologies allow access to an abundance of information, that students can work faster with the aid of computer, that computers provide independence empowerment and autonomy, that computers can compensate for students' disabilities, and that they allow students to easily edit and revise their work.

See Table 18

Table 17

Where Do Students Use Their Computer Technologies?

Location Of Computer And Internet Use	Number Of Students	%
Students Who Use A Computer	35	95%
Computer Users Who Use A Computer At School	28	80%
Computer Users Who Use A Computer At Home	30	86%
Computer Users Who Use A Computer In Library	16	46%
Computer User Students Who Use The Internet	28	80%
Internet Users Who Use The Internet At Home	22	79%
Internet Users Who Use The Internet At School	20	71%
Internet Users Who Use The Internet In Library	6	21%

Table 18

Advantages Of Computer Technologies For Students With Disabilities Noted By Students And Personnel Responsible For Providing Services To Students With Disabilities

Advantages	Students			Personnel Responsible For Providing Services To Students With Disabilities		
	# Of Students Indicating This	% Of Students' Responses	% Of Students Indicating This	# Of Service Providers Indicating This	% Of Service Providers Responses	% Of Service Providers Indicating This
Word processing means no need to handwrite or retype, neat presentation, can cut & paste	19	17%	54%	6	6%	20%
Access to lots of information, opens up the world	16	14%	46%	8	8%	27%
Can work faster, easier, saves time	13	12%	37%	7	7%	23%
Independence, empowerment, and autonomy	8	7%	23%	12	13%	40%
Compensates for disabilities	8	7%	23%	11	12%	37%
Editing work is easier, easy corrections, multiple copies, can check work, can reprint work	8	7%	23%	4	4%	13%
Can work at one's own pace and schedule	8	7%	23%	1	1%	3%
Spell check, grammar check, dictionary and thesaurus	7	6%	20%	7	7%	23%
Communication is made easy	6	5%	17%	5	5%	17%
Needed to proceed in education and for the job market - provides opportunities	3	3%	9%	4	4%	13%
Gives confidence, no writer's block, reduces stress	3	3%	9%	3	3%	10%
Allows one to work like others	3	3%	9%	1	1%	3%
Internet is cheaper than long distance	3	3%	9%	0	0%	0%
Fun	2	2%	6%	1	1%	3%
Keeps students organized, allows them to find things quickly	2	2%	6%	1	1%	3%
Don't lose ideas because can get them down on paper fast enough	2	2%	6%	0	0%	0%
Cost-effective	1	1%	3%	5	5%	17%
Students can perform at their full potential, levels the playing field	0	0%	0%	14	15%	47%
Allows students to take their own notes in class	0	0%	0%	3	3%	10%
Helps student learn material	0	0%	0%	2	2%	7%

Note. Only one response per person responsible for providing services to students with disabilities or computer user student participant is counted in each category. All participants responded to this question. Mean number of responses = 3.20 per student participant and 3.17 per service provider. All respondents listed at least one advantage. Boxed areas indicate the greatest discrepancies between students and service providers.

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Overall, however, students' and personnel responsible for providing services to students with disabilities' lists were not correlated significantly, r(18) = .33, p>.05. This is because substantial numbers of individuals in both groups noted advantages that members of the other group did not mention. For example, students noted a variety of advantages that service providers did not remark upon: they noted that computers allowed them to work at their own pace and schedule - this was especially important for students with medical conditions whose energy levels fluctuated during the day. Some students also noted that the internet was cheaper than long distance. Similarly, personnel responsible for providing services to students with disabilities mentioned advantages that students did not indicate. For example, they noted that computer technologies were cost-effective, as these allowed the office for students with disabilities to free up human resources, that computers level the playing field by allowing students to perform at their full potential, and that computers allow students to take their own notes in class, rather than having to rely on others' notes or having to audiotape.

Disadvantages

The disadvantages of computer technologies for students with disabilities are listed in Table 19. These indicate that, generally, students and personnel responsible for providing services to students with disabilities are in reasonably good agreement about the disadvantages of computers; results of a Pearson product moment correlation, which indicates a significant coefficient, r(18)=.84, p < .01, confirm this conclusion.

See Table 19

Both groups agreed that computer, information and adaptive technologies take a long time to learn, and that they are frustrating and not user-friendly. Similarly, both groups mentioned the need to keep up-to-date, rapid obsolescence, the need for continual upgrading, and not knowing what is available. Cost, crashes, break downs, lengthy repair times, lost work, unhelpful help lines, and unsupported products are also frequently noted disadvantages.

However, students also indicated that computers often fail to adequately meet their disability related needs. They noted that products are inaccurate (e.g., dictation software), work poorly (e.g., grammar checkers), cannot cope with certain tasks (e.g., voice software cannot read graphics), and are inaccessible (can't control mouse with shaky hands). Personnel responsible for providing services to students with disabilities also mentioned some disadvantages that students did not indicate. For example, they noted that computer technologies interfere with social activities, provide a false sense that the computer will solve all problems, and that use of these technologies by instructors will cause loss of human contact with students. They also mentioned lack of adequate on-campus training and tech support as a disadvantage. Moreover, they noted that students can become accustomed to using hardware and software which is available on campus but unavailable elsewhere (e.g., the home, the workplace). They also noted that some students who are uncomfortable with computers are being forced to use them.

Table 19

Disadvantages Of Computer Technologies For Students With Disabilities Noted By Students And Personnel Responsible For Providing Services To Students With Disabilities

Disadvantages	Students			Personnel Responsible For Providing Services To Students With Disabilities		
	# Of Students Indicating This	% Of Students' Responses	% Of Students Indicating This	# Of Service Providers Indicating This	% Of Service Providers Responses	% Of Service Providers Indicating This
Long to learn, unfriendly, frustrating	13	22%	37%	10	16%	33%
Need to keep up-to-date, obsolescence, continual upgrading, not knowing what's available	10	17%	29%	9	14%	30%
Cost	10	17%	29%	8	13%	27%
Crashes, break downs, repairs take long, lost work, unhelpful help lines, products not supported	9	15%	26%	8	13%	27%
Doesn't meet disability related needs well (inaccurate, works poorly, can't read graphics, can't operate it)	8	13%	23%	2	3%	7%
Dependence on technology - what if: it breaks down, there is no computer available, no electricity	2	3%	6%	3	5%	10%
Health concerns (eye strain, voice strain)	2	3%	6%	1	2%	3%
Not available at school	2	3%	9%	1	2%	3%
Interferes with social activities	1	2%	3%	3	5%	10%
Compatibility problems	1	2%	3%	2	3%	7%
Problems with bilingual use	1	2%	3%	0	0%	0%
Hard to use on public transit	1	2%	3%	0	0%	0%
False sense that computer will solve all problems	0	0%	0%	4	6%	13%
Lack of adequate on-campus training and tech support	0	0%	0%	3	5%	10%
Campus technology unavailable elsewhere (home, work place)	0	0%	0%	3	5%	10%
Students made uncomfortable by computers are forced to use them	0	0%	0%	2	3%	7%
Over-dependence on technology by instructors, lose their "personal touch", lack of human contact	0	0%	0%	2	3%	7%
Security and insurance	0	0%	0%	1	2%	3%
Prevents development of skills	0	0%	0%	1	2%	3%
Using computer technologies can single out students who don't wish to be singled out	0	0%	0%	1	2%	3%

Note. Only one response per participant is counted in each category. Only 29 students and 28 service providers indicated disadvantages, the rest said there were none. Mean number of responses = 2.07 per student participant and 2.29 per person responsible for providing services to students with disabilities.

Boxed areas indicate the greatest discrepancies between students and personnel responsible for providing services to students with disabilities.

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How Do Students And Personnel Responsible For Providing Services To Students With Disabilities Find Out About What Exists "Out There?"

Students

Students who use computers indicated an average of 2.26 sources of learning about new computer technologies. These are presented in Table 20 and show that word of mouth, the internet and mainstream magazines are their most popular sources of information. Several students also mentioned an adaptive technology trainer as well as television. It should be noted that some students thought of mainstream computers while others thought of adaptive equipment when answering this question.

See Table 20

Personnel responsible for providing services to students with disabilities

The internet has become the most widely used source of information for personnel responsible for providing services to students with disabilities. Conferences, equipment manufacturers and distributors, and word of mouth were also popular resources. A detailed listing of resources used by personnel responsible for providing services to students with disabilities can be seen in Table 20.

Wish Lists

Students

Table 21, which provides a comprehensive listing, indicates that students generally wanted more, better, and more up-to-date specialized hardware, software, and adapted furniture both at home and at school. Students who did not have home computers or who did not have adaptations at home wanted these available at home. Similarly, students who did not have internet access at home wanted this, while those who already had it wanted faster connections. Like the personnel responsible for providing services to students with disabilities, students too indicated that they wanted user friendly voice software to control the computer and do dictation.

See Table 21

Students also noted a variety of important items about computers at school. In particular, they indicated that they wanted more computers at school and in the library, that they wanted accessible library catalogues with printing capability and that if they did not have this, they wanted a laptop for use at school.

Table 20

How Do People Find Out About What Exists "Out There?" Students' And Personnel Responsible For Providing Services To Students With Disabilities' Responses

	Students			Personnel Responsible For Providing Services To Students With Disabilities		
Sources Of Information	# Of Students Indicating This	% Of Students' Responses	% Of Students Indicating This	# Of Service Providers Indicating This	% Of Service Provider Responses	% Of Service Providers Indicating This
Word Of Mouth	24	30%	69%	9	11%	33%
Internet	13	16%	37%	18	22%	67%
Mainstream Magazines	10	13%	29%	2	2%	7%
Adaptive Technology Trainer	6	8%	17%	3	4%	11%
TV	6	8%	17%	0	0%	0%
Equipment Distributors/Manufacturers	4	5%	11%	10	12%	37%
Specialized Magazines	4	5%	11%	6	7%	22%
Organizations For People With Disabilities	4	5%	11%	3	4%	11%
Conferences	3	4%	9%	11	13%	41%
The "Other" Group: Service	3	4%	9%	3	4%	11%
Faculty	0	0%	0%	6	7%	22%
Disabled Student Services Colleagues	N/A	N/A	N/A	6	7%	22%
Other	2	3%	6%	5	6%	19%

Note. Only one response per participant is counted in each category. 35 students and 27 persons responsible for providing services to students with disabilities responded to this question

Table 21

Students' Wish List In Rank Order

What They Want	# Of Responses	% Of Responses	% Of Students
Home computer if student does not have one or better, faster, more up-to-date	22	21%	63%
Better/more up-to-date specialized hardware/software and adapted furniture at school	11	11%	31%
Specific adaptive equipment for home use	11	11%	31%
Easy to use voice software to control computer and do dictation	10	10%	29%
Home Internet access if student does not have or faster Internet access at home	9	9%	26%
More computers at school and in the library	8	8%	23%
Accessible library catalogues with printing capability	7	7%	20%
Laptop for use at school	6	6%	17%
More information about what is "out there"	3	3%	9%
More training opportunities at school	3	3%	9%
More recognition of learning disabilities at the institution, including testing	3	3%	9%
Accessible locations to plug in adapted computers and modems of students' laptops	3	3%	9%
More user friendly, reliable equipment	2	2%	6%
Better technical support	2	2%	6%
Improved software and hardware (e.g., learning disabilities software, scanner and	2	2%	6%
Internet in library	1	1%	3%
Full text articles available electronically from library	1	1%	3%

Note. Only one responses per computer user participant is counted in each category. 35 students responded to this question. Mean number of responses per participant = 2.97

Personnel responsible for providing services to students with disabilities

So what do personnel responsible for providing services to students with disabilities want for their students? Table 22, which provides a comprehensive listing, indicates that they generally want more, better, and more up-to-date specialized hardware and software. Half of the respondents wanted user friendly multi-user voice software to control the computer and do dictation. They also want students to be able to work autonomously in the library; while many mentioned that there is an adapted computer in the library, they also indicated that their computers had serious limitations. For example, they did not permit students to get assistance from librarians on internet resources or to print out information retrieved from library catalogues or internet and CD-ROM resources. Another issue noted by approximately 1/3 of respondents was decentralization of adaptive equipment; service providers wanted accessible work stations in various buildings on campus and they wanted adapted equipment in mainstream computer labs. Laptops, mainly for use in loan programs, were also popular.

See Table 22

Overall Institutional Evaluation Of Computer Accessibility For Students With Disabilities

What do personnel responsible for providing services to students with disabilities consider the most successful aspects of their institution's computer accessibility?

The personnel responsible for providing services to students with disabilities most often mentioned aspects related to available equipment and to service provision. They also mentioned good access to mainstream computer labs and the internet as well as helpful and supportive computer and technology experts at their institutions. Details are provided in Table 23.

See Table 23

What do personnel responsible for providing services to students with disabilities consider the least successful aspects of their institution's computer accessibility?

Unsuccessful features of their programs noted by personnel responsible for providing services to students with disabilities include inadequate funding and equipment as well as outdated software and hardware. On the human side, lack of interest and collaboration form other departments was cited. Problems also included lack of space, problematic evening access to computer, information and adaptive technologies and lack of equipment for loans. Details are provided in Table 24.

See Table 24

Table 22

Personnel Responsible For Providing Services To Students With Disabilities' Wish List

What They Want	# Of Responses	% Of Responses	% Of Service Providers
More & better: money, up-to-date specialized hardware/software	16	17%	62%
Easy to use multi-user voice software to control computer and do dictation	13	14%	50%
Adapted equipment & catalogue in library, including printer, on-line & CD-ROM resource	10	11%	38%
Decentralization of equipment, accessible work stations in other buildings and computer	8	9%	31%
Laptops	7	8%	27%
Site licenses	5	5%	19%
Space	5	5%	19%
Adaptive computer technologies and training center	4	4%	15%
More technology for students with hearing impairments	4	4%	15%
Someone to show students & staff how equipment works & to trouble shoot problems in	3	3%	12%
Ergonomic furniture	3	3%	12%
More computer resources for students with learning disabilities	3	3%	12%
Technician time	2	2%	8%
Easier Internet access	2	2%	8%
Mini-workshops on adaptive technology	1	1%	4%
Being able to try out equipment before buying	1	1%	4%
Comprehensive electronic text catalogue	1	1%	4%
Library staff knowledgeable about Internet research	1	1%	4%
Mobile adapted work station	1	1%	4%
Profs providing lecture notes on line	1	1%	4%
Learning disabilities diagnostic software	1	1%	4%

Note. Only one response per participant is counted in each category. 26 participants responded to this question.

Table 23

Successful Features Of The Institutions' Computer Accessibility

What Works Well	# Of Responses	% Of Responses	% Of Disability Service Providers
Computer technologies in the specialized lab are available to students when needed, well stocked lab	6	18%	24%
Have been able to provide individualized, user friendly tech support to students	4	12%	16%
Students have excellent access to mainstream computer labs and the Internet	4	12%	16%
Institution's computer and technology experts are helpful and supportive	5	15%	20%
Able to help some students improve their writing skills	2	6%	8%
Successfully serve a large clientele	2	6%	8%
Success with grants and fund raising	2	6%	8%
Students are successfully using computers to write their exams	2	6%	8%
Have taught computer science students about adaptive technologies	2	6%	8%
Have obtained software for students with learning disabilities	1	3%	4%
A new adapted work station in the library provides many students with independence	1	3%	4%
Providing each student with a designated work station with a computer customized for	1	3%	4%
Successfully mixing students with and without disabilities in the specialized computer	1	3%	4%
Good support, resources and networking in the institution	1	3%	4%

Table 24

Unsuccessful Features Of The Institutions' Computer Accessibility

What Works Poorly	# Of Responses	% Of Responses	% Of Disability Service Providers
Not enough money, not enough equipment, equipment not sufficiently up-to-date	9	29%	36%
Little interest or collaboration from other divisions of the institution, including faculty	5	16%	20%
Not enough space	3	10%	12%
Should have evening access to technology, but don't	3	10%	12%
Should have equipment available for loans, but don't	2	6%	8%
Cannot provide services to all students with disabilities (i.e., foreign students, landed	1	3%	4%
Nobody on staff with expertise in learning disabilities	1	3%	4%
No adaptive technologies available outside the DSS area	1	3%	4%
Insufficient evaluation of technologies	1	3%	4%
Not enough time to teach students about what computers can do	1	3%	4%
Transportation problems make it difficult for some students to use DSS computers	1	3%	4%
Students don't have enough time to learn to use computer technologies	1	3%	4%
Voice recognition is frustrating for many students	1	3%	4%
There are not enough trainers	1	3%	4%

Note. Only one response per disability service provider participant is counted in each category. 25 participants responded to this

Implications And Conclusions

The findings indicated that more extensive information from a larger, more diverse sample of students is needed. In particular, data from non users of computers is necessary to produce a more comprehensive picture. Phase III of this investigation provides these details.

The findings on personnel responsible for providing services to students with disabilities indicate that they have needs and concerns that are often different from those of the students. Because of the nature of their tasks, issues that concern them frequently relate to institutional concerns, budgets, relations with other sections of their institutions, etc. It is clear that more focused investigation of personnel responsible for providing services to students with disabilities and their experiences with computer and adaptive technologies is called for.

PHASE III: QUESTIONNAIRE STUDY - METHOD AND FINDINGS

Overview

During the fall of 1998 a questionnaire was developed for dissemination to college and university students with disabilities across Canada. Questionnaires, which contained 29 groups of questions, were adapted for administration in the following formats in both English and French: regular and large print, audiotape, Braille, and computer disk (IBM and Macintosh). Questionnaires were distributed in three ways. (1) We contacted personnel responsible for providing services to students with disabilities and asked them to make questionnaires available on their campuses. Service providers indicated the number of questionnaires they wanted in each format. They also indicated the number of students registered to receive services provided by the institution for students with disabilities. Questionnaires were mailed in January and February 1999. (2) Questionnaires were mailed directly to students who are members of our two student partner organizations [National Educational Association of Disabled Students (NEADS) and the Association Québécoise des étudiants(es) handicapés(es) au post secondaire (AQEHPS)]. (3) A limited number of questionnaires were distributed by team members to personal contacts. In addition, 5 questionnaires were returned by individuals who responded to an e-mail version of the questionnaire sent to subscribers of the newly formed NEADS listserv NEADS-L. In total, 736 questionnaires were returned by current or recent Canadian students with disabilities. Of these, 11 were excluded from the analysis because they had not been students during the past 2 years, leaving a total sample size of 725

Participants

Participants were 725 Canadian college and university students with various disabilities (425 females and 300 males). Participants represent 154 Canadian colleges and universities and 176 different autonomous institutions (many colleges and universities have autonomous campuses; these are generally located in different cities and often have unique campus-based policies, equipment and personnel responsible for providing services to students with disabilities). Except for two Canadian students who were studying in the United Sates, all participants were currently or recently (during the past 2 years) enrolled in a Canadian junior/community college or university.

Participants represent all Canadian provinces and territories and include current college (n=335) and university students (n=294), including 11 distance education students. 29 participants were not currently enrolled in a postsecondary educational institution but had been students during the past 2 years. 67 participants were not enrolled in a diploma or degree program, but were merely taking courses (see Table 25). 616 responses are in English. Of the 109 responses in French, 82% are from Quebec and rest from four other provinces: Ontario (12%), Alberta (1%), Nova Scotia (1%), and New Brunswick (4%).

See Table 25

The composition of the final student sample of 725 (425 females, 300 males) is as follows. 96% of participants were students when they completed the questionnaires; the remainder were not currently students but had been attending school during the previous 2 years. 48% of current students were pursuing a college diploma or certificate (179 females, 156 males), 42% were pursuing an undergraduate

Table 25

Demographics: Numbers Of Students

Variable	Whole Sample		Pursuing College Diploma	Pursuing University Degree	Student During Past 2 Years But Not currently	Taking Courses
	#	%				
Total Number Of Participants	725		335	294	29	67
Females	425	59%	179	187	20	39
Males	300	41%	156	107	9	28
Language Reported Spoken More Often	718					
English	605	84%	253	266	27	59
French	113	16%	80	24	2	7
Age	719					
Mean	29.73		29.94	28.77	29.90	32.84
Standard Deviation	10.38		10.78	10.01	7.35	10.61
Range	17-75		17-64	18-75	21-47	19-75
Duration Of Impairment						
Since Childhood (Age <10)		50%				
In Between		39%				
Acquired Recently (Past 5 Years)		11%				
Field Of Study[1]						
Arts	475	67%				
Social Science	417	59%	186	192	17	22
Fine Arts	35	5%	10	17	6	2
Unclassifiable Arts	23	3%	4	11	1	7
Science And Technology	202	29%				
Pure Science	74	10%	26	41	3	4
Technology/Computers/Engineering	128	18%	88	25	2	13
Other	28	4%	15	1	0	12

[1] 705 students responded to this question.

or graduate university degree (187 females, 107 males) and 10% were taking courses outside of a formal diploma or degree program (39 females, 28 males). Table 25 provides additional details.

The average total enrollment in the 154 colleges and universities represented by students was 8714 (standard deviation = 9400, range = 200 to 50,000, median = 5160). The mean percentage of students with disabilities was 3.22% (standard deviation = 4.56, range = less than 1% to 27.27%, median = 1.61%). Most students were enrolled in institutions in small (population under 100,000; 39%) and medium (population between 100,000 and 1,000,000; 43%) sized communities and a smaller proportion came from large cities (population over 1,000,000; 18%).

Mean age of students was 30 (standard deviation = 10, range = 17 to 75). The median was 26. It can be seen in Figure 1 that the distribution is definitely skewed in favor of younger students. Eighty-seven percent of responses were received in regular print and 8% of responses were on large print questionnaires. Although the remaining 5% of student participants may have received questionnaires in a different modality [i.e., regular and large print, audiotape, Braille, computer disk (IBM and Macintosh), e-mail], their responses arrived in a variety of formats: 4% arrived on diskette, 1% via e-mail, and less than 1% in Braille. It should be noted that all non-print versions of the questionnaire were accompanied by a regular print version, thus it is possible that students read the questions in an alternate format but responded using the regular print questionnaire.

See Figure 1

Students had a variety of impairments/disabilities. Consistent with the Canadian trend, the largest group of students (37%) had a learning disability [this includes attention deficit disorder (ADD/ADHD)]. 27% of the sample had a mobility impairment, 24% had a visual impairment, 22% had problems using their hands or arms, 15% had a medical impairment, 15% had a hearing impairment, 12% had a psychiatric impairment, and 8% had a speech impairment. Close to half of the sample had multiple impairments. Indeed, the mean number of impairments was 1.74 per student. (see Table 26).

See Table 26

Half of the responses (50%) indicated that the student's disability was present since childhood (age less than 10), and only 11% of responses reflected a recently acquired disability (past 5 years), with the remaining responses indicating somewhere in between (see Table 27).

See Table 27

It can be seen in Table 25 that the majority of students were enrolled in arts (67%) while slightly less than a third (29%) were enrolled in science and technology programs. The programs of the remaining 5% of students could not be classified (e.g., "funeral service", "fleuriste", "physical activities studies"). Overall, students in the present sample closely resemble postsecondary student samples in other investigations (Fichten, Goodrick, Tagalakis, Amsel, & Libman, 1990).

Procedure

Questionnaires were distributed and collected in the spring of 1999. Questionnaire items were based on findings from Phase II of this project: interviews with 37 college and university students with disabilities and with 30 personnel responsible for providing services to students with disabilities. Questionnaires went through multiple drafts. Two earlier versions were scrutinized by our Advisory Board as well as by participants in our

Figure 1

Age Of Respondents

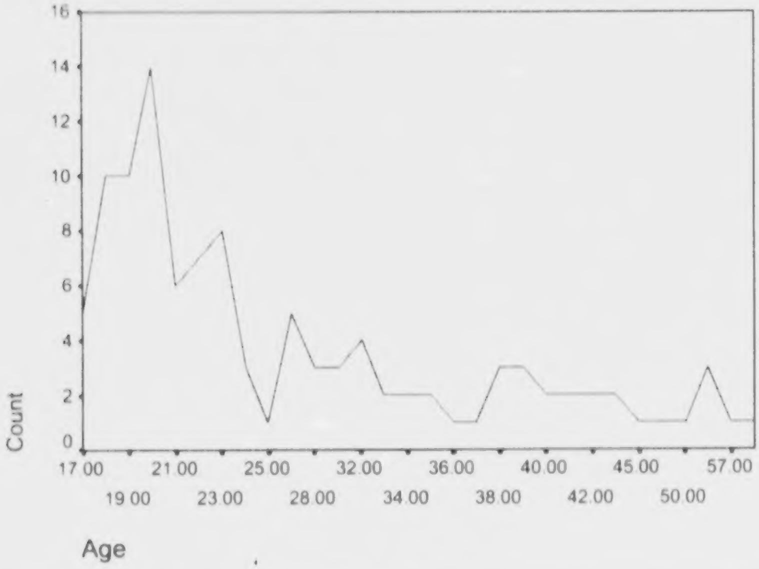


Table 26

Descriptive Statistics: Students

Variable	# Of Students	% Of Students
Students' Disabilities		
Visual Impairment	172	24%
Totally Blind	35	5%
Low Vision	137	19%
Medical Impairments	109	15%
Psychiatric Impairments	87	12%
Other	91	13%
Learning Disability	271	37%
Mobility Impairment &/Or Wheelchair User	196	27%
Wheelchair User	104	14%
Mobility Impairment	92	13%
Problems Using Arms Or Hands	162	22%
Hearing Impairment	108	15%
Deaf	30	4%
Hard Of Hearing	78	11%
Speech Impairment	59	8%
Number Of Different Impairments Per Student		
1 Impairment		58%
2 Impairments		24%
3 Impairments		11%
4 Impairments		5%
5 Impairments		2%
6 Impairments		1%
7 Impairments		0%
8 Impairments		<1%

Table 27

Duration Of Students' Disabilities/Impairments

	Visual Impairment		Hearing Impairment				Neuromuscular Impairment			Medical Or Psychiatric Impairments		
Duration Of Impairment	Totally Blind	Low Vision	Deaf	Hard Of Hearing	Speech Impairment	Learning Disability	Wheelchair User	Mobility Impairment	Difficulty Using Arms Or Hands	Medical Impairment	Psychiatric Impairment	Other Disability
Since Childhood (Age <10)	44%	49%	89%	64%	62%	80%	29%	44%	29%	29%	38%	33%
In Between	34%	41%	11%	32%	33%	14%	64%	45%	52%	53%	43%	51%
Acquired Recently (Past 5 Years)	22%	10%	0%	4%	5%	6%	7%	11%	19%	18%	19%	16%

moderated listserv: Adaptech. These two versions were also pretested by 35 students with various disabilities before the third and final version was completed. Pretesting included the various adapted versions of the questionnaire both in English and French. Students had the option of responding in the modality of their choice. Most items requested yes/no answers or ratings of agreement/disagreement using a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree).

Questionnaires were distributed primarily through bulk mailings to 204 college and university personnel responsible for providing services to students with disabilities who agreed to make these available to students at their institution. 6756 questionnaires were distributed in this manner. Personnel responsible for providing services to students with disabilities indicated the number of questionnaires they wanted in each format and language [i.e., regular and large print, audiotape, Braille, computer disk (IBM and Macintosh)]. A substantial number of questionnaires were also distributed to the members of our two partner organizations: 413 questionnaires were sent to NEADS members and 100 to AQEHPS members. A small number of questionnaires, 28, were distributed in other ways detailed below.

Questionnaire packages (see Appendix 8) included a stamped, self addressed envelope, cover letter, consent form, and a "tear-off" form to complete if students wanted a copy of the findings; here students could specify the format of the report (e.g., large print, computer disk, audiotape). All non-print versions distributed were packaged together with a regular print version of the questionnaire.

Once completed questionnaires were received, open-ended responses (e.g., name of adaptive equipment used, program of study) were quantified using predetermined categories and, along with the closed-ended responses, entered into an Excel spreadsheet for subsequent analysis using SPSS (Statistical Package for the Social Sciences) Version 8.

Questionnaire Development

During the summer and fall of 1998 we used data from Phase II of this investigation to formulate an objective questionnaire consisting of 29 groups of items. Two earlier versions were extensively pretested prior to finalizing the questionnaire.

Multiple drafts were prepared before the first version of the questionnaire was ready for pretesting. Once a version was agreed upon, it was translated into French and altered to met the requirements of the various alternative formats: regular and large print, audiotape, Braille, computer disk (IBM and Macintosh). With each format, care was taken to ensure that the format of questions was appropriate to the modality and that the student had the option to respond in alternative ways. For example, references to "circling numbers" or "placing a check mark" did not make sense for the cassette tape or the Braille versions. Extensive formatting changes had to be made for the large print version. Modifications had to be made for the diskette version which would permit respondents to either answer directly on the diskette or to respond by typing, e-mailing, Brailling or audiotaping. IBM diskettes contained 3 file formats; DOS, ASCII text, Word 6.0/95, and WordPerfect 5.1 (DOS). Mackintosh diskettes contained 6 file formats: plain text, ClarisWorks 4, WordPerfect 2, Word 4.0, MacWrite II, and Rich Text Format. We are presently preparing an article on how such adaptations are best made.

The process for creating each of the two versions that were pretested followed this cycle: (1) meetings were held during which project team members proposed and reviewed suggested questions; (2) several drafts were generated where questions were removed, added, adjusted, etc.; (3) once a finalized version was agreed upon, the various formats were generated and reviewed; (4) the questionnaire was forwarded to our pretest participants (we had different pretest groups for each version, each language, and each of our alternative formats) as well as to our Advisory Board and interested members of our on line electronic forum, Adaptech; (6) feedback was collected at the end of each of the two pretest periods and was reviewed and taken into consideration before the next version was compiled. Pretest participants (16 females and 22 males) came from the lists of NEADS and AQEHPS members and from personal contacts. They represented all 10 Canadian provinces and the Yukon Territory. Pretest participants were instructed to complete the questionnaires on their own. They were then telephoned to collect their answers; these were transcribed onto a print version of the questionnaire. Pretest participants were then interviewed and asked a series of questions related to time taken to complete the questions, how well the format worked for them, what the participant liked and disliked about the questions, the "layout" of items, and whether any instructions or questions were offensive or confusing (see Appendix 9).

Questionnaire

The final questionnaire consisted of 29 groups of questions: most are closed-ended and use a 6-point Likert scale with 1 indicating strongly disagree and 6 indicating strongly agree (see Appendix 8). Questionnaires are available in English and French. In addition to the regular print versions, both the English and French questionnaires are available in the following alternate formats: large print, audiotape, Braille, IBM-PC (3 file formats)and Macintosh (6 file formats)disk. Questions on the adapted versions were modified to permit respondents both to read and to complete the measure using alternate means of responding. This was also true of an e-mail version that we prepared and distributed in late spring of 1999. Adapted versions in both languages are available in the EvNet Toolkit at the following Word Wide Web URL: http://socserv2.mcmaster.ca/srnet/toolkit/tktoc.htm.

Illustration 7

Topics Covered in the Questionnaire

1. *Sex*
2. *Age*
3. *Language*
4. *Province where resident*
5. *Name and location of postsecondary educational institution*
6. *Field of study*
7. *Qualifications pursued*
8. *Nature and duration of disabilities/impairments*
9. *Computer, information and adaptive technologies used at home*
10. *Home computer technologies wish list*
11. *Computer, information and adaptive technologies used at school*
12. *School computer technologies wish list*
13. *Determinants and predictors of computer use and non-use*
14. *Adaptive computer technologies that could be useful to respondent in getting work done*
15. *Recommendations to adaptive software and hardware companies*
16. *Reasons for not using a computer*
17. *Type of computer used*
18. *Locations where computer is used during the school year*
19. *Time spent using a computer and the internet*
20. *Reasons for not using the internet*
21. *Uses of the internet for the respondent*
22. *Reasons for not taking advantage of a government program to obtain a computer or adaptive computer technologies*
23. *Experiences with government programs which provide computer or adaptive computer technologies*
24. *How did respondents obtain their computer or adaptive computer technologies*
25. *Problems caused by computer technologies for the respondent*
26. *Problems using computer technologies at school*
27. *Are specialized adaptations needed to use a computer*
28. *Reasons why needed specialized adaptations are not used*
29. *Other issues (open-ended items)*

Informed consent

All versions of the questionnaire contained informed consent information. This specified the purpose of the project, benefits envisaged, task requirements, the right to withdraw at any time without penalty and the measures taken to ensure confidentiality. Potential participants were also informed that they may discuss any questions or concerns about this study with the project directors at any time.

Help desk

One feature of our questionnaire was the availability of a bilingual Help Desk which participants could call collect if they had questions or experienced problems. Only six people took advantage of this service. One additional individual phoned one of the principal investigators and two additional persons e-mailed questions.

Participant Recruitment

Questionnaires were distributed in three ways: through personnel responsible for providing services to students with disabilities, through mailed distribution by our student partner organizations: NEADS and AQEHPS, through personal contacts and, in a very limited way, through e-mail.

Personnel responsible for providing services to students with disabilities

A directory of personnel contacts is published by the National Educational Association of Disabled Students (NEADS) by the Association Québécoise des Étudiants Handicapés au Postsecondaire (AQEHPS), as well as by the Service d'Aide à l'Intégration Des Élèves (SAIDE) and le Services aux étudiants handicapés du Cégep de Sainte-Foy. We sought the help of individuals on these lists as well as of all service providers who worked at universities, including distance education institutions, which are members of the AUCC (Association of Universities and Colleges of Canada) or at colleges, including distance education institutions, which are members of either the ACCC (Association of Canadian Community Colleges) or the Fédération des Cégeps. The directories cited above were checked against the membership lists of the AUCC, ACCC and the Fédération des Cégeps to ensure that no school was omitted, even if it didn't appear in one of the specialized directories. Personnel responsible for providing services to students with disabilities are the individuals identified at postsecondary institutions who are charged with any number of support services to postsecondary students with disabilities (in a small number of situations where there was no individual specifically designated to perform this task, primarily in smaller institutions, we were directed to staff in either counselling, student services or the registrar's office). They or their staff made the questionnaires available to students at their institutions.

The 204 participating personnel responsible for providing services to students with disabilities were solicited as follows. We phoned 268 individuals at Canadian universities and community/junior colleges, including distance education institutions, who were members of: the Association of Colleges and Universities of Canada (AUCC), the Association of Canadian Community Colleges (ACCC), or the Fédération des Cégeps or whose names appeared on the lists described above.

It should be noted that not all higher education institutions belong to the three postsecondary associations we sampled and that in several cases some, but not all of the various campuses of universities and colleges are members. Canadian colleges and universities we contacted had autonomous campuses ranging from 1 to

13. Thus, we contacted 268 institutions which appeared on the memberships lists of AUCC, ACCC, the Fédération des Cégeps as well as the limited number of institutions which were unique to NEADS, AQEHPS, the SAIDE or le Service aux étudiants handicapés du Cégep de Sainte-Foy (i.e., colleges or universities and separate campuses of these if they were listed). There was considerable overlap between the Fédération des Cégeps, where we contacted all 48 public Cégep members) and the ACCC. To obtain a better notion about the types of institutions represented by the ACCC we provide the following description from their web page.

> *"The member institutions of the Association of Canadian Community Colleges (ACCC), while broadly known as community colleges, are in fact distinguished by a range of titles including institutes of technology, cégep, and university college. Because education is a provincial or territorial responsibility, these institutions vary in mandate, management models and policy frameworks. However, they share the primary functions of responding to the training needs of business, industry, the public service sectors and the educational needs of vocationally oriented secondary school graduates. Historically, these institutions offered diplomas and certificates, not degrees. However, many have university transfer programs and some are offering now degree programs."* Downloaded June 14, 1999 from the ACCC web site on the World Wide Web URL: <http://www.accc.ca/english/members/index.htm>.

Research team members phoned 268 personnel responsible for providing services to students with disabilities at institutions whose names appeared on these lists. In cases where we mailed questionnaire packages to multiple campuses (e.g., regional colleges where campuses were located in different cities), we counted these as individual institutions.

Once someone was reached, this individual was provided with an explanation of the goals of our project and asked if they would be willing to assist us by distributing our questionnaires to students with disabilities attending their institution. It was explained that: we were looking for both users and non-users of computers; that we were interested in hearing from the largest cross-section of students with disabilities; and that we had questionnaires available in a variety of alternative formats (regular and large print, on tape, in Braille and on computer disk).

Of the 268 institutions we telephoned, 25 indicated that they had no students with disabilities (9%), 2 declined to participate (1%), 37 were left telephone messages but failed to return our calls (14%), and the remaining 204 agreed to participate. Thus, of the 243 institutions which indicated that they had students with disabilities, 204 (84%) agreed to participate. Personnel responsible for providing services to students with disabilities who agreed to make questionnaires available at their institutions were asked how many questionnaires in each of the formats they were willing to receive. A total of 204 institutions were sent packages containing 6756 questionnaires.

Personnel responsible for providing services to students with disabilities indicated the number of questionnaires they wanted in each format and language. Institutions were sent between 1 and 600 questionnaires (range = 1 to 600, standard deviation = 63, median = 14) (see Table 28). (Although one institution requested 800 questionnaires, only 600 were sent; this is the only instance where we modified an institution's request.) The format of most of the questionnaires requested was regular print (79%). 7% were on audiotape, 6% in large print, 5% on IBM diskette, 2% in Braille, and less than 1% on Macintosh diskette.

See Table 28

Questionnaires were sent to the 204 personnel responsible for providing services to students with disabilities at the various colleges and universities in January and February of 1999 (see Table 29). Of the 204 institutions where questionnaires were sent, 150 were English, 52 were French and 2 were bilingual. 64% of questionnaires were sent to colleges, 35% to universities, and 2% to distance education institutions. The number of questionnaires distributed to French and English institutions in the various regions of Canada can be seen in Table 29.

Table 28

Number, Language And Modality Of Questionnaires Sent To Personnel Responsible For Providing Services To Students With Disabilities

Language	# Of Institutions[1]	Total Questionnaires Sent	Regular Print	Large Print	Audiotape	Braille	IBM Diskette	Macintosh Diskette
Total								
Total	204	6756	5330	429	502	108	359	28
Average / Institution		32.80	25.87	2.08	2.44	0.52	1.74	0.14
Percentage Of Total Sent			79%	6%	7%	2%	5%	<1%
Minimum		1	0	0	0	0	0	0
Maximum		600	579	40	60	20	50	10
Standard Deviation		63.39	58.12	4.24	6.14	1.69	4.34	0.87
Median		13.50	10	1	0	0	0	0
English								
Total	152	6292	4983	371	492	91	327	28
Average / Institution		41.39	32.78	2.44	3.24	0.60	2.15	0.18
Percentage Of Total Sent			79%	6%	8%	1%	5%	<1%
Minimum		1	0	0	0	0	0	0
Maximum		600	579	40	60	20	50	10
Standard Deviation		71.68	66.15	4.65	6.96	1.87	4.91	1.01
Median		20	14	1	1	0	1	0
French								
Total	54	464	347	58	10	17	32	0
Average / Institution		8.59	6.43	1.07	0.19	0.31	0.59	0.00
Percentage Of Total Sent			75%	13%	2%	4%	7%	0%
Minimum		1	0	0	0	0	0	0
Maximum		52	50	15	4	7	9	0
Standard Deviation		9.73	8.76	2.55	0.65	1.02	1.56	0.00
Median		5	4	0	0	0	0	0

[1] Only 204 institutions were mailed questionnaires, but 2 of these are bilingual, and both French and English questionnaires were sent.

See Table 29

Once the packages reached the institutions, we left it up to the discretion of the personnel responsible for providing services to students with disabilities how they would make questionnaires available to students. A cover letter was included with each package that directed those receiving them to make them available to the "widest cross-section" of students with disabilities, and to make them available to both computer, information and adaptive technologies users and non-users, if at all possible (see Appendix 10).

All participating institutions were recontacted within the first four months of 1999 to ensure that they had received the questionnaires, to answer any additional questions they had, to remind these individuals to make questionnaires available, and to find out how many students with disabilities were registered to receive services for students with disabilities at their institution. Wherever possible, actual statistics were provided. However in some cases estimates and approximations were furnished. It should be noted that these figures do not necessarily represent the total number of students with disabilities attending any given institution. Rather, they represent students who have self-identified themselves to the institution and are eligible to receive support services.

These follow-up phone calls to schools also revealed the following information regarding how our questionnaires were made available to students: (1) some placed our questionnaires in public areas (e.g., computer labs, on counters in the office providing services to students with disabilities) for students to pick up; (2) some sent the questionnaires to various points of contact for students with disabilities (e.g., advisors, counsellors, etc.) who were then asked to make these available to students; (3) some schools mailed our questionnaires to students directly; (4) some service providers distributed the questionnaires themselves; and 5) one school offered food (pizza party) as an incentive for students to come and complete our questionnaires. The number of schools using specific distribution methods is unknown. This makes it impossible to calculate a "return rate".

Direct mailings

We announced the existence of the questionnaire and the intended target audience on several listservs, although we did not include the questionnaire. In response to this publicity and through personal contacts 28 questionnaires were distributed. 513 questionnaires were mailed by our partner organizations directly to students who are members: 413 to NEADS members and 100 to AQEHPS members. Because Quebec students can be members of both organisations, it is likely that some students received two questionnaires. Also, both student organizations have many members who are not currently students. Nevertheless, these questionnaires are the only ones that were actually directly distributed to potential respondents. How many of these questionnaires were returned is unknown.

Other distribution methods

In November 1998, NEADS launched the NEADS-L listserv, a discussion forum intended primarily for Canadian postsecondary students. To contact students who had not been reached through our other distribution methods, in April 1999 we made minor modifications to the English diskette version of the questionnaire to allow for on-line responding and posted it to the NEADS-L listserv via e-mail. Only questionnaires from current students or students who attended a Canadian postsecondary educational institution recently were retained. Because the membership of the NEADS-L listserv can fluctuate, even daily, and because the listserv is open to anyone to join, it is impossible to say how many actual students received the questionnaire in this manner. However, we were advised that a person responsible for providing services to students with disabilities at a distance education institution electronically forwarded the online version of

Table 29

Questionnaires Sent To Personnel Responsible For Providing Services To Students With Disabilities

Variable	Atlantic Region		Central Region		Western Region		Territories		Total		
	# Institutions	# Questionnaires	# Institutions[1]	# Questionnaires	# Institutions	# Questionnaires	# Institutions	# Questionnaires	# Institutions	# Questionnaires	% Questionnaires
Total									204	6756	
College	21	274	68	2269	56	1736	2	12	147	4291	64%
University	13	291	29	1455	13	606			55	2352	35%
Distance Education					2	113			2	113	2%
English									150	6173	
College	20	269	29	1976	56	1736	2	12	107	3993	65%
University	11	260	17	1201	13	606			41	2067	33%
Distance Education					2	113			2	113	2%
French									52	424	
College	1	5	39	293					40	298	70%
University	2	31	10	95					12	126	30%
Distance Education									0	0	0%
Bilingual[1]			2						2	159	
University: English			2	119						119	75%
University: French			2	40						40	25%
Total	34	565	97	3724	71	2455	2	12	204	6756	
% of Total	17%	8%	48%	55%	35%	36%	1%	<1%			

Note. Atlantic Region includes Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick, Central Region includes Quebec and Ontario, Western Region includes Manitoba, Saskatchewan, Alberta, and British Columbia, and Territories includes the Yukon and Northwest Territories.

[1] Only 204 institutions were mailed questionnaires, but 2 of these are bilingual, and both French and English questionnaires were sent.

the questionnaire that appeared on NEADS-L to a number of students with disabilities. Again, actual numbers of students who received our questionnaire this way is unknown. We can say with certainty that 5 students completed the questionnaire as a result of its appearance on the NEADS-L listserv.

City Size

To obtain information about the cities where respondents' educational institutions were located, chambers of commerce, almanacs, and web pages were consulted. For the purposes of the present investigation, cities and towns were grouped into three categories: small (population under 100,000), medium (population between 100,000 and 1,000,000), and large (population over 1,000,000).

Total Institutional Enrolment

To get a sense of the size of each postsecondary institution, data concerning total student enrolments were obtained. For universities, the Association of Universities and Colleges of Canada's (AUCC) web site was consulted. The web site included standardized profiles of all member institutions; this included their most current enrolment figures. The web site presented enrolment statistics for undergraduate and graduate students, both full and part-time. For each school listed, we summed these numbers to obtain the total population of each participating institution.

For colleges, neither the ACCC nor the Fédération des Cégeps web site contained enrolment information. Indeed, because different provinces, and different colleges in some cases, use a variety of categories for classifying their students, an alternate approach had to be taken. In British Columbia, the Advanced Education Council of British Columbia was contacted. They provided us with a fax containing 1997-98 total enrolment information for all colleges in their province (Della Mattia, 1999). Similarly, the Ontario College Application Service (OCAS) (Bondy, 1999) and the Alberta Ministry of Advanced Education and Career Development (Gnanafihamany, 1999) both e-mailed us their latest (1997) college total enrolment statistics. In Quebec, the 1999 AQEHPS report contained enrolment statistics for all Cegeps (Association Québécoise des Étudiants Handicapés au Postsecondaire, 1999). Nova Scotia has one major public college system (Nova Scotia Community College), with multiple campuses across the province. Their web site was used to obtain the campus total enrolment statistics. In other Nova Scotia colleges the registrar's offices were contacted directly. New Brunswick has a system similar to Nova Scotia's. Enrolment statistics showing the various college campuses and total enrolments were faxed by the NBCC Head Office (Bourassa, 1999). The Saskatchewan Institute of Applied Science and Technology (SIAST) also provided a report, giving statistics for all of its campuses (Saskatchewan Institute of Applied Science and Technology, 1999). Registrars' offices at other colleges in Saskatchewan were contacted directly. Similarly, in Manitoba, Prince Edward Island and the Territories, registrars' offices at participating institutions were contacted directly.

Numbers Of Students With Disabilities At Each Institution

For all institutions outside Québec, the number of students with disabilities at each institution was provided by our contact people - the personnel responsible for providing services to students with disabilities. These individuals were asked how many students with disabilities were currently registered/identified at their institution. In some cases, actual figures were supplied. In other cases, however, approximations were made. In Quebec, data on the number of students with disabilities were obtained from a study conducted during 1998 by AQEHPS (1999) where personnel responsible for providing services to students with disabilities were contacted and asked to provide the information; information for 64 institutions are provided.

Student enrolments at the institutions where questionnaires were made available and percentages of students with disabilities at English and French institutions can be seen in Table 30.

See Table 30

Similarly, enrolments and percentages of students with disabilities at English and French institutions where student participants attended school (i.e., those institutions which participants indicated that they attended) are available in Table 31.

See Table 31

RESULTS AND DISCUSSION

Limitations Of This Investigation

Before presenting the findings, it must be noted that this investigation has a number of limitations. While the sample size is large - 725 individuals - and diverse both in age and in terms of students' academic programs, disabilities and computer experiences, it is by no means random. Nor is it representative. Given self-selection biases, we expect that the proportion of computer users as well as of individuals who are in contact with their institutions' offices for providing services to students with disabilities are over represented. In addition, most students with disabilities do not belong to national or provincial student organizations. Perhaps even more troubling, we are unable to calculate a "return rate" because of the manner in which questionnaires were made available to students. Some questionnaires were handed to students by personnel responsible for providing services to students with disabilities. Others, were mailed directly to students' homes. In the overwhelming majority of cases, however, the distribution method was akin to the way in which "free" advertiser supported newspapers are distributed. For example, "Computing Canada" and "Hour," which are put in boxes or racks near entrances and exits and made available for shoppers to pick up, free of charge, in computer stores and supermarkets, respectively. Another problematic area concerns the calculation of percentages of students with disabilities attending Canadian colleges and universities. In many instances, personnel responsible for providing services to students with disabilities gave exact "head counts." Others however, gave "estimates." In the case of institutions in Québec, we relied on a recent survey; it is possible that definitions used in this survey, which are consistent with how disabilities are defined by Quebec government organisations, is more restrictive than definitions used in other areas of Canada. Thus,

Table 30

Characteristics Of Institutions Where Questionnaires Were Sent

Language	# Of Institutions	# Of Questionnaires Sent	Student Enrollment	# Of Students With Disabilities	% Of Students With Disabilities
Total					
Total	204	6756			
Average / Institution		3280	8,745	221	2.92%
Minimum		1	200	1	< .01%
Maximum		600	50,000	1830	27.27%
Standard Deviation		63	8,884	291	4.02%
Median		14	5,212	142	1.32%
English					
Total	152	6292			
Average / Institution		41	9,701	294	3.88%
Minimum		1	200	1	0.05%
Maximum		600	44,275	1830	27.27%
Standard Deviation		72	8,690	308	4.31%
Median		20	6,765	214	2.50%
French					
Total	54	464			
Average / Institution		9	5,987	28	0.33%
Minimum		1	250	0	0.00%
Maximum		52	50,000	514	3.25%
Standard Deviation		10	8,943	79	0.60%
Median		5	3,744	5	0.13%

Note. In addition, 413 English questionnaires, mainly regular print, were sent to NEADS members and 100 regular print French questionnaires to AQEHPS members. Some students from Quebec are members of both organizations.

Table 31

Characteristics Of Institutions From Which Questionnaires Were Received

Language	# Of Universities And Colleges Attended By Participants[1]	# Of Questionnaires Received	Total Student Enrollment[2]	# Of Students With Disabilities[2]	% Of Students With Disabilities[2]
Total					
Total	156	725			
Average / Institution		4.65	8,714	228	3.22%
Minimum			200	1	<0.01%
Maximum			50,000	1830	27.27%
Standard Deviation			9,400	293	4.56%
Median			5,160	139	1.60%
English					
Total	119	616			
Average / Institution		5.18	9,180	294	4.16%
Minimum			200	1	0.05%
Maximum			38,792	1830	27.27%
Standard Deviation			8,870	309	4.89%
Median			5,252	214	2.27%
French					
Total	37	109			
Average / Institution		2.95	7,237	28	0.34%
Minimum			256	1	0.01%
Maximum			50,000	286	2.91%
Standard Deviation			10,920	54	5.96%
Median			3,805	5	0.14%

[1] The 156 colleges and universities represent 176 different autonomous institutions.

[2] Total student enrollments and numbers of students with disabilities were available for different numbers of institutions. The percentage of students with disabilities reflects only those institutions where both values were available.

percentages of students with disabilities enrolled in Quebec colleges and universities may be systematically lower than those in other provinces. This possibility, which affects both English and French schools, is one that we are investigating in a current study where the focus is on Quebec's students with disabilities.

Yet, those indices which are available suggest that the sample has characteristics which resemble the realities of postsecondary students with disabilities. The age range of students is normative for studies of students with disabilities. The sample contains more female than male students; this, too, is characteristic of postsecondary students in Canadian colleges and universities. The majority of students use IBM-compatible computers. This too, is typical of postsecondary students. The proportion of arts and science students, too, is typical of other studies of students with disabilities, as is the high proportion of students with learning disabilities. Possibly the most valuable aspect of this investigation is not the "representativeness" of the sample but the ability to answer specific questions requiring comparisons of different groups of students. What are differences between male and female students? College and university students? What about student age? What kinds of equipment do students with different disabilities need and want? What do students with specific needs find problematic and what do they find really helpful? The study's main strength lies in its ability to provide answers to such questions.

Proportion Of Students With Disabilities

As noted in Phase II, there are great discrepancies among institutions in the percentage of students with disabilities. To better understand the reasons for this we examined variables related to the proportion of students with disabilities in the larger sample of institutions in Phase III for which data are available. Where possible, we used data from all 174 different Canadian colleges and universities for which data on total enrolment and numbers of students with disabilities were available; this includes Canadian institutions where we either sent questionnaires or from which we received at least one completed questionnaire.

The average full time enrolment at the 174 colleges and universities was 7821 (standard deviation = 8979, range = 200 to 50,000, median = 4745). As was the case in Phase II, the scores suggests that there were many small and a few very large schools in our sample and that discrepancies among institutions were substantial.

Information concerning the percentage of students with disabilities on campus is available for 162 colleges and universities. These show results that are very similar to those reported for Phase II. For example, the data show that the mean percentage of students with disabilities at these institutions was 2.74% (standard deviation = 4.09, range = <.01 to 27.27, median = 1.13). Thus, in most institutions fewer than 2% of students were registered with offices responsible for providing services to students with disabilities. This can readily be seen in Figure 2.

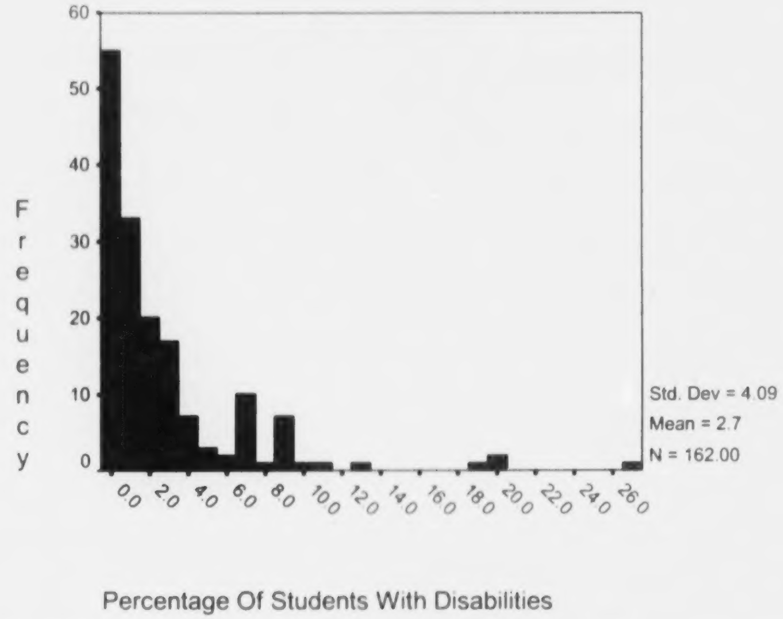
See Figure 2

Is size of city related to the percentage of students with disabilities?

As in Phase II, we explored the possibility that the proportion of students with disabilities is related to the size of the city in which the institution is located. Two types of analyses were undertaken. First, an analysis of variance (ANOVA) comparison was made using city size as the independent variable. Results and the means in Table 32 indicate that while city size was significantly related to total enrollments both of students in general, F(2,171), = 18.52, p<.001, as well as of students with disabilities, F(2,160) = 9.15,

Figure 2

Percentage Of Students With Disabilities In Canadian Colleges And Universities



$p<.001$, city size was not related significantly to the percentage of students with disabilities, $F(2,159)=2.05$, $p>.05$. The second type of analysis involved correlating city size and percentage of students with disabilities; the correlation coefficient, $r(160)= -0.067$, $p>.05$, also was nonsignificant. Consistent with results noted in Phase II, the answer to the question posed above is, once more, "Definitely not."

See Table 32

Is size of the institution related to the percentage of students with disabilities?

We also thought that the size of the institution may be related to the proportion of students with disabilities. To examine this possibility we correlated the percentage of students with disabilities with the total enrollment of the institution for the 162 participating colleges and universities for which data were available. The nonsignificant Pearson product-moment correlation coefficient, $r(160)= -.089$, $p>.05$, indicates that the size of the institution is not related to the proportion of students with disabilities. This, too, is consistent with findings in Phase II.

Is type of institution related to the percentage of students with disabilities?

Since colleges and universities may attract and host different student populations, it was also possible that the type of institution is related to the percentage of students with disabilities. Table 33 presents the data which answer the question above. An independent samples t-test which compared scores in colleges and universities was conducted. Results show a significant difference, with colleges hosting a significantly larger proportion of students with disabilities than universities, $t(158)=4.12$, $p<.001$. It should be noted that while this comparison approached significance when the smaller sample of institutions in Phase II was evaluated, here, with the larger sample, the results are clear cut.

See Table 33

As for total numbers of students with disabilities, findings in Table 33 show that total enrollment in universities ($M = 13,745$) was significantly greater than in colleges ($M = 4,968$), $t(170) = 5.31$, $p<.001$. Yet, as in Phase II, here also there was no significant difference between universities ($M = 194$) and colleges ($M = 186$) on the total number of students with disabilities enrolled, $t(159)= .18$, $p>.05$.

Is the language of the institution related to the percentage of students with disabilities?

It was also possible that French and English institutions host different numbers of students with disabilities. This is especially likely as students with learning disabilities, who typically make up about 1/3 of English institutions' populations of students with disabilities, are not considered to have a disability in Quebec. To evaluate this possibility we conducted a series of t-tests to examine differences between English and French institutions. Because there was a significant difference between colleges and universities found earlier, we analyzed college and university data separately.

Data presented in Table 34 show, clearly, that the percentage of students with disabilities in English institutions is substantially greater than in French institutions. Indeed, the data are significant even after a Bonferroni correction to the alpha level. It is noteworthy that the percentage of students with disabilities is 10 times greater in English than in French universities and 20 times greater in English than in French colleges. We believe that the discrepancy is partly explained by two known factors. First, the definition of

Table 32

Enrollment As A Function Of City Size

Variable	Small City		Medium City		Large City	
	# Of Institutions	Mean	# Of Institutions	Mean	# Of Institutions	Mean
Total Enrollment	101	4730	48	10948	25	14302
# Students With Disabilities	90	122	47	321	26	195
% Students With Disabilities	90	2.74%	47	3.46%	25	1.42%

Note. All institutions for which data are available. Small; < 100,000; Medium 100,000 to 1,000,000; Large > 1,000,000.

Table 33

Differences Between Colleges And Universities

Variable	Institution	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Total Student Enrollment	College	116	4968	5563	5.31	170	0.000
	University	56	13745	11651			
Total Number Of Students With Disabilities	College	107	194	301	0.18	159	0.860
	University	54	186	210			
% Students With Disabilities	College	106	3.43%	4.84	4.12	158	0.000
	University	54	1.38%	1.22			

disability used in the AQEHPS (1999) report was somewhat more limited than the one used by non-Quebec institutions. Second, learning disabilities are not considered a disability Quebec. While these two factors can account for some of the discrepancies, we believe that they do not account for all of these. First, in English institutions across Canada, only 1/3 of students with disabilities have a learning disability. Second, the AQEHPS report also indicated substantial differences between Quebec Anglophone and Francophone institutions even when the same definition, which excluded students with learning disabilities, was used. Nevertheless, the difference in methodology for ascertaining the proportion of students with disabilities could account for the significant results; this is a possibility that is explored in our current research, where the focus is specifically on Quebec students with disabilities.

See Table 34

Students' Experiences With Computer, Information And Adaptive Technologies

Users and non-users of computers: college and university students

The overwhelming majority of respondents, 692 of the 725 participants (95%) indicated that they used a computer. The proportion was the same in colleges and universities. 41% of computer users indicated that they needed adaptations to do so (e.g., screen magnification, dictation software, Braille note taker).

English and French institutions

Basically, there were no differences in the proportion of computer users between students from English and French institutions. It can be seen in Table 35 that approximately 95% of students used a computer and that approximately 87% used the internet.

See Table 35

Sex differences

To evaluate differences between female and male students with disabilities a Chi Square test and a series of independent t-tests were performed. The Chi Square test shows that male and female students are equally likely to use computers (females: 403 use computers, 22 do not; males, 289 use computers, 11 do not), $X^2=.92$, $p>.05$. Of 21 t-tests on variables related to attitudes, views and practices toward computer use, only 3 are significant (see Table 36). After a Bonferroni correction to the alpha level, even these fail to be significant. The single comparison which approaches significance after the Bonferroni correction suggests that on a 6-point scale, male students with disabilities ($M=4.28$) considered themselves to be more expert computer users than female students ($M=3.95$) believed themselves to be, $t(720)=2.69$, $p<.01$.

See Table 36

Table 34

Differences Between French And English Institutions

Variable	Institution	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Colleges							
Total Student Enrollment	English	77	6000	6460	2.81	113	0.006
	French	38	2984	1937			
Total Number Of Students With Disabilities	English	68	299	335	7.10	104	0.000
	French	38	10	19			
% Students With Disabilities	English	68	5.20%	5.27%	7.72	103	0.000
	French	37	0.25%	0.38%			
Universities							
Total Student Enrollment	English	40	13448	10437	0.41	51	0.681
	French	13	15024	15863			
Total Number Of Students With Disabilities	English	38	229	222	3.20	49	0.002
	French	13	29	40			
% Students With Disabilities	English	38	1.67%	1.14	7.96	49	0.000
	French	13	0.16%	0.16			

Table 35

Computer And Internet Use: French And English Students

	Computer Users		Non-Users		Internet Use	
	#	%	#	%	% of Computer Users Who Also Use The Internet	% of Computers Users Who Do Not Use The Internet
Whole Sample	692	95%	33	5%	87%	13%
English Institutions	589	96%	27	4%	87%	13%
French Institutions	103	94%	6	6%	86%	14%

Note. Of the total sample of 725, 616 respondents are from English institutions and 109 from French.

Table 36

Sex Differences In Attitudes, Views And Practices Toward Computer Use

		Mean[1]	Std	t	df	Sig. (2-tailed)
In general, I rarely use computer technologies	Females	1.94	1.56	0.425	719	0.671
	Males	1.89	1.53			
In general, I consider my level of expertise with computer technologies to be very good	Females	3.95	1.60	-2.687	720	0.007
	Males	4.28	1.65			
Computer technologies that meet my needs are unavailable to me	Females	2.64	1.73	-0.550	705	0.582
	Males	2.71	1.68			
Getting my work done more easily is important to me	Females	5.74	0.79	1.815	719	0.070
	Males	5.62	0.99			
I am a person who dislikes computers	Females	1.92	1.45	1.724	719	0.085
	Males	1.74	1.40			
There are opportunities for me to learn how to use computer technologies	Females	4.47	1.58	-1.522	718	0.128
	Males	4.65	1.50			
Computer technologies are inadequate in meeting my needs effectively	Females	2.62	1.62	-0.268	714	0.789
	Males	2.66	1.70			
I do not plan to become more knowledgeable about computers	Females	1.68	1.22	2.077	718	0.038
	Males	1.50	1.09			
What friends think about computers is unimportant to me	Females	4.04	1.99	1.340	712	0.181
	Males	3.84	1.88			
When I have problems with my computer technologies, I can get help easily	Females	3.97	1.69	-0.693	717	0.489
	Males	4.06	1.67			
Computers crash often	Females	3.28	1.58	-1.446	713	0.149
	Males	3.46	1.63			
Computer technologies I need cost too much	Females	4.61	1.58	-0.135	712	0.892
	Males	4.63	1.46			
I think working efficiently on computers is unimportant	Females	1.39	1.02	-1.416	715	0.157
	Males	1.51	1.23			
Using computer technologies effectively is likely to help me get my work done more easily	Females	5.63	0.93	1.265	719	0.206
	Males	5.54	1.03			
Friends don't think using computers is helpful	Females	1.64	1.09	-0.675	715	0.500
	Males	1.70	1.12			
In general, there are good computer facilities for me to use	Females	4.45	1.53	-1.512	717	0.131
	Males	4.61	1.37			
I can comfortably use computer technologies if I need to	Females	4.64	1.42	-0.646	719	0.518
	Males	4.71	1.47			
There are people available to show me how to use computer technologies	Females	4.20	1.59	0.824	718	0.410
	Males	4.10	1.55			
My friends think I should use computer technologies	Females	4.69	1.43	-1.265	699	0.206
	Males	4.83	1.32			
In general, my financial situation allows me to meet my needs	Females	2.71	1.81	-2.322	709	0.020
	Males	3.02	1.71			
Overall, I am very dissatisfied with my experiences with computers	Females	2.28	1.56	1.026	708	0.305
	Males	2.16	1.54			

Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree

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Age differences

We examined the relationship between student age and a host of variables related to attitudes, views and practices toward computer use. An independent t-test shows no significant difference between the mean age of students who use computers (M=29.62) and those who do not (M=32.06), t(718)=1.32, p>.05. Correlations between age and relevant variables for computer user students are presented in Table 37. Given the sample size, it is not surprising that several of the Pearson product-moment correlation coefficients were significant. However, of these, only one variable reached an r value of .20, suggesting that age was not substantially related to the variables of interest.

See Table 37

Equipment For Students With Disabilities

All students indicated the types of adaptive computer technologies that could be useful in getting their work done. It can be seen in Table 38 that the most popular computer technologies were sophisticated or adapted versions of mainstream equipment which students felt they needed to accommodate their disabilities. For example, the most valued technology was spelling and grammar checking, followed by a scanner and a portable note taking device (not a laptop) that could be taken to class. Dictation software (voice recognition) and the availability of materials in electronic format (e.g., books, hand-outs) were also seen as especially useful. It should be noted that while such equipment is likely to be useful for all students, for students with disabilities such technologies are a necessity. Appendix 11 provides a listing of brand names of the different products students indicated could be useful in getting work done. Table 18 in Phase II provides student's perspectives on such technologies.

See Table 38

284 of the 692 computer user students (41%) indicated that they needed special adaptations to use a computer. The types of adaptations students with specific disabilities felt would be useful are presented in Table 39.

See Table 39

It is noteworthy that only 166 of the 284 students who indicated that they needed adaptations (58%) used them. When asked why they did not use adaptations, it can be seen in Table 40 that the overwhelmingly endorsed answer was that it costs too much (mean rating was 5.50 on a 6-point scale). Other reasons cited include: it is unavailable to students, they are uncertain about where to buy these, they don't know how to use the equipment, and equipment is too expensive to maintain.

See Table 40

What Kinds Of Equipment Do Students Who Use Computers Actually Use?

93% of computer users use a computer at home and 95% use a computer at school. 87% of these students use the internet. It can be seen in Table 41 that 64% of students use the internet at home and 77% use it at school. Most respondents who do not have a computer (62%) or internet access (78%) at

Table 37

Age And Experiences Of Computer User Students

Variable	Correlation with Age
Experiences	
In general, I rarely use computer technologies	**.103(**)**
In general, I consider my level of expertise with computer technologies to be very good	**-.143(**)**
Computer technologies that meet my needs are unavailable to me	**.178(**)**
Getting my work done more easily is important to me	**.079(*)**
I am a person who dislikes computers	0.027
There are opportunities for me to learn how to use computer technologies	0.002
Computer technologies are inadequate in meeting my needs effectively (e.g., too inaccurate or slow)	0.006
I do not plan to become more knowledgeable about computers	0.006
What friends think about computers is unimportant to me	0.036
When I have problems with my computer technologies, I can get help easily	**-.078(*)**
Computers crash often	**-.096(*)**
Computer technologies I need cost too much	**.082(*)**
I think working efficiently on computers is unimportant	-0.04
Using computer technologies effectively is likely to help me get my work done more easily	0.044
Friends don't think using computers is helpful	0.036
In general, there are good computer facilities for me to use	**-.103(**)**
I can comfortably use computer technologies if I need to	**-.214(**)**
There are people available to show me how to use computer technologies	-0.045
My friends think I should use computer technologies	0.03
In general, my financial situation allows me to meet my needs	**-.143(**)**
Overall, I am very dissatisfied with my experiences with computers	**.094(*)**
Time during a typical school week spent	
Using a computer - not including time spent on the internet (number of hours per week)	**.183(**)**
Using the internet (number of hours per week)	-0.043
Computer technologies cause problems for me because:	
They are difficult to learn	**.123(**)**
They cost too much to buy	**.095(*)**
Using them causes me physical discomfort	**.161(**)**
They are frustrating / difficult to use	0.071
They crash	**-.116(**)**
They need to be repaired often	-0.005
There are hardware and software compatibility problems (e.g., Document saved on one computer does	0.057
They are inadequate in meeting my needs	0.058
They have to be upgraded continuously	0.046
They make me dependent on them	-0.05
Computer labs where my courses are held lack suitable adaptations for me (e.g., No dictation software)	**.169(**)**
Manufacturers fail to support their products	**.142(**)**
There are few opportunities for training on adaptive technologies	**.173(**)**

* $p < .05$
** $p < .01$

Table 38

The Following Adaptive Computer Technologies Are/Could Be Useful In Getting School Work Done: Whole Sample

Variable	Mean	Std. Deviation
A spell checker / grammar checker	5.42	1.17
A scanner	4.84	1.54
A portable note taking device (not referring to a laptop)	4.72	1.71
Dictation software (voice recognition software that types what you say)	4.68	1.85
Having material available in electronic format (e.g., books, hand-outs)	4.68	1.69
Other specialized software for learning disabilities (e.g., word prediction)	4.14	2.04
Voice control software (you give voice commands like "file," "open," - e.g., VoicePad)	4.11	1.98
A large screen monitor	4.00	2.08
A screen reader (software that reads what's on the screen)	3.93	2.13
Mouse adaptations (e.g., head mouse, track ball)	3.77	2.10
Software that enlarges what is on the screen	3.46	2.12
Keyboard adaptations (e.g., "sticky keys")	3.20	2.08
A Braille printer	1.92	1.74
Braille translation software	1.80	1.67

Note. Responses were made on a 6-point Likert scale, with higher scores indicating that this type of equipment is/would be useful. Almost half of the sample had more than 1 impairment.

Table 39

The Following Adaptive Computer Technologies Are/Could Be Useful For Students: Responses Of Students With Specific Disabilities

	Mean	Mean	Mean	Mean
	Totally Blind	Low Vision	Deaf	Hard of Hearing
A screen reader (software that reads what's on the screen)	5.52	4.48	3.00	3.45
Software that enlarges what is on the screen	2.11	4.98	3.77	2.90
A scanner	5.37	5.08	4.55	4.63
Braille translation software	4.55	2.16	1.75	1.81
A portable note taking device (not referring to a laptop)	5.13	4.45	4.28	4.38
A large screen monitor	2.05	5.26	3.59	3.38
A braille printer	4.41	2.21	1.89	2.19
A spell checker / grammar checker	5.65	5.39	5.25	5.28
Other specialized software for learning disabilities (e.g., word prediction)	2.44	3.24	2.93	3.91
Keyboard adaptations (e.g., "sticky keys")	2.88	3.49	2.90	3.43
Mouse adaptations (e.g., head mouse, track ball)	3.44	3.84	3.53	3.41
Dictation software (voice recognition software that types what you say)	3.96	4.45	2.92	4.16
Voice control software (you give voice commands like "file," "open,")	3.70	4.02	2.40	3.51
Having material available in electronic format (e.g., books, hand-outs)	5.52	4.91	4.18	4.37

	Speech / Communication Impairment	Learning Disability	Wheelchair User	Mobility Impairment
A screen reader (software that reads what's on the screen)	3.70	4.49	2.80	3.54
Software that enlarges what is on the screen	3.00	3.35	2.92	3.75
A scanner	4.74	5.01	4.20	5.11
Braille translation software	1.48	1.38	1.39	1.61
A portable note taking device (not referring to a laptop)	4.67	4.73	4.71	4.67
A large screen monitor	3.74	4.13	2.89	4.47
A braille printer	1.60	1.59	1.28	1.79
A spell checker / grammar checker	5.39	5.73	4.84	5.38
Other specialized software for learning disabilities (e.g., word prediction)	4.05	5.26	3.07	3.48
Keyboard adaptations (e.g., "sticky keys")	3.21	3.09	2.87	4.19
Mouse adaptations (e.g., head mouse, track ball)	3.19	3.83	3.42	4.51
Dictation software (voice recognition software that types what you say)	4.10	5.00	4.60	4.71
Voice control software (you give voice commands like "file," "open,")	3.70	4.37	4.07	4.42
Having material available in electronic format (e.g., books, hand-outs)	4.63	4.83	4.10	4.61

	Difficulty Using Arms or Hands	Medical Impairment	Psychiatric Impairment	Other Disability
A screen reader (software that reads what's on the screen)	3.42	4.26	3.91	3.64
Software that enlarges what is on the screen	3.24	3.72	3.62	3.67
A scanner	4.59	5.26	5.19	5.21
Braille translation software	1.48	1.82	1.54	1.29
A portable note taking device (not referring to a laptop)	5.13	4.88	5.00	4.94
A large screen monitor	3.69	4.47	4.54	4.56
A braille printer	1.46	2.20	1.96	1.62
A spell checker / grammar checker	5.25	5.43	5.61	5.53
Other specialized software for learning disabilities (e.g., word prediction)	3.82	4.49	4.70	4.27
Keyboard adaptations (e.g., "sticky keys")	3.94	4.15	3.96	4.35
Mouse adaptations (e.g., head mouse, track ball)	4.29	4.74	4.56	4.77
Dictation software (voice recognition software that types what you say)	5.09	5.11	4.82	4.91
Voice control software (you give voice commands like "file," "open,")	4.69	4.59	4.06	4.55
Having material available in electronic format (e.g., books, hand-outs)	4.61	5.01	4.65	4.83

Note. Responses were made on a 6-point Likert scale, with higher scores indicating that this type of equipment is / would be useful. Almost half of the sample had more than 1 impairment.

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Table 40

Reasons Why The 42% Of Computer User Students Who Need Adaptations Are Not Using These

Reasons	Mean[1]	Standard Deviation
It costs too much	5.50	1.10
It is unavailable to me	4.98	1.46
I am uncertain about where to buy it	4.85	1.82
I don't know how to use it	4.13	1.92
It is too expensive to maintain	3.92	1.81
Available computers don't have appropriate adaptive hardware/software on them	3.86	2.11
It is impossible for me to get it through a government program or an educational institution lending prograr	3.76	1.74
Adaptive technology I need to use a computer works poorly for me	3.03	1.75
It is too difficult to learn	2.70	1.73
The technology makes me anxious	2.53	1.83
I am not interested in using it	1.77	1.40

Note. 284 of the 692 (41%) computer user students who responded to this question indicated that they needed special adaptations to use a computer. Only 166 of them (58%) indicated that they used adaptations.

[1] Responses were made on a 6-point Likert scale, with 1 = strongly disagree and 6 = strongly agree.

home wish that they did. Similarly, although relatively few students indicated using a laptop either at home (20%) or at school (23%), large numbers of students who do not have a laptop wish that they had one.

See Table 41

Table 42 presents data about what types of computers students use and where they use them. Most students use an IBM compatible (93%); only 15% use a Macintosh (some students used several types of computers). 7% of students use another type of computer (e.g., Tandy, Commodore). Students who use a computer at school use it most often in a computer lab (78%) or in the library (61%); a significant minority (43%) use computers in an office for students with disabilities or in a specialized lab. Only about 1/3 of students use computers during class lectures.

See Table 42

Students' responses indicated that English and French postsecondary educational institutions are very similar in the availability of desktop computers at school (see Table 43). English institutions appear to have the edge when it comes to laptops, adaptive hardware and software, and the internet. Colleges and universities appear to provide similarly high levels of access to all types of computer information and adaptive technologies.

See Table 43

Students indicated spending approximately 13 hours during a typical school week using a computer (exclusive of the internet) and 7 hours using the internet. Table 44 shows that English and French students are very similar on these variables.

See Table 44

The most frequently noted reason for using the internet is doing research (M=5.42 on a 6-point scale). Other popular reasons include e-mail (friends, family and professors), accessing library materials, and entertainment. Table 45 provides additional details

See Table 45

When computer users who do not use the internet were asked why, their responses, detailed in Table 46, indicate that using the internet ties up the phone line, that they had no access to a computer that is equipped to go on line, and that it costs too much. No student indicted that it is unavailable in their area, and very few indicated that it was unavailable at their school.

See Table 46

Problems With Computers Noted By Students Who Are Computer Users

In Table 47 it can be seen that the most common problem noted by students is that computer technologies cost too much to buy (M = 4.80 on a 6-point scale). Other problems include: the need for continual upgrading (M = 3.87), few opportunities for training on adaptive technologies (M = 3.59), hardware and software compatibility problems (M = 3.44) (e.g., document saved on one computer does not work on another), and computer labs where courses are held lacking suitable adaptations (M = 3.38) (e.g., no dictation software).

Table 41

Computer, Information And Adaptive Technologies Used And Desired At Home And At School

Variable	Home		School	
	% Who Use This	% Of Those Who Don't Use This But Wish They Did	% Who Use This	% Of Those Who Don't Use This But Wish They Did
Desktop Computer	84%	62%	89%	22%
Laptop Computer	20%	53%	23%	36%
Adaptive Computer Hardware (e.g., Braille display)	16%	18%	14%	10%
Adaptive Software (e.g., software that enlarges what is on the screen)	26%	28%	26%	18%
Internet	64%	78%	77%	23%

Note. Data refer to students who indicated that they used a computer.

Table 42

Computer User Students: What Computers They Use And Where They Use Them

Variable	% Of Computer User Students
What Types Of Computers Students Use[1]	
IBM Compatible	93%
Macintosh	15%
Other Type Of Computer	7%
Students Have Used Computers In The Following Locations	
At Home	93%
During Class Lectures (e.g., writing lecture notes, in-class assignments)	37%
In The Library (e.g., doing assignments on a computer located in the library)	61%
In A Disabled Student Services Office / Specialized Lab	43%
In A Computer Lab	78%
At Work	50%

Note. 629 students use a computer.

[1] Several students use more than one type of computer

Table 43

Computer, Information And Adaptive Technologies Used At School: Demographic Factors

Type Of Equipment Used	Language of Institution		Type of Institution		Sex	
	English Institutions	French Institutions	College	University	Females	Males
A Desktop Computer	89%	88%	93%	84%	87%	91%
A Laptop Computer	24%	18%	16%	30%	22%	24%
Adaptive Computer Hardware (e.g., Braille display)	15%	9%	14%	14%	14%	15%
Adaptive Software (e.g., software that enlarges what is on the screen)	29%	12%	24%	24%	27%	25%
The Internet	79%	67%	81%	76%	74%	82%

	Size of City			Canadian Region			
	Small	Medium	Large	Atlantic	Central	Western	Territories[1]
A Desktop Computer	93%	86%	85%	95%	88%	88%	100%
A Laptop Computer	24%	20%	23%	15%	22%	25%	0%
Adaptive Computer Hardware (e.g., Braille display)	15%	14%	13%	17%	15%	12%	50%
Adaptive Software (e.g., software that enlarges what is on the screen)	26%	26%	27%	37%	21%	30%	75%
The Internet	88%	71%	66%	86%	75%	77%	50%

Note. Data refer to those 692 students who indicated that they used a computer.

[1] Because of small sample size, these data should not be considered reliable.

Table 44

Computer User Students: How Much Time They Spend Using Computers During A Typical School Week

Variable	Mean	Std. Deviation	Range	
Whole Sample				
Time Spent Using A Computer Exclusive Of The Internet	12.75 hr	11.01	<1hr	100hr
Time Spent Using The Internet	7.39 hr	9.36	<1hr	100hr
English Students				
Time Spent Using A Computer Exclusive Of The Internet	12.59hr	10.80	<1hr	100hr
Time Spent Using The Internet	7.52hr	9.51	<1hr	100hr
French Students				
Time Spent Using A Computer Exclusive Of The Internet	13.72hr	12.19	1hr	50hr
Time Spent Using The Internet	6.65hr	8.46	<1hr	50hr

Note. 87% of English and 86% of French computer users use the Internet.

Table 45

Uses Of The Internet For Students Who Use It

Purpose	Mean[1]	Std. Deviation
Doing research	5.42	1.04
E-mailing friends/family	5.30	1.36
Accessing library materials	4.40	1.61
Entertainment	4.35	1.68
E-mailing my professors	3.90	1.88
Looking for a job	3.51	1.90
Getting software / updates / demos	3.51	2.05
Participating in listservs/news groups	2.68	1.97
Participating in chat rooms	2.41	1.87
Banking/shopping	2.04	1.64
Taking courses on-line	2.01	1.67

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Table 46

Why Computer Users Do Not Use The Internet

Reasons	Mean[1]	Std. Deviation
It ties up the phone line	4.00	2.07
I have no access to a computer that is equipped to go on-line	3.91	2.07
It costs too much	3.67	1.78
The available browser / e-mail program (e.g., Netscape, Eudora) does not work well for me	2.86	1.77
I am not interested in using it	2.27	1.42
Some features of web sites are inaccessible to me	1.86	1.21
It is not available at school	1.44	1.01
It is unavailable in my area	1.00	0.00

Note. 87 computer user students indicated that they did not use the internet.

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = stronly agree.

See Table 47

The most common problem with computers located at school is that both mainstream computer labs and specialized labs with adaptive equipment are generally overcrowded. Table 48 provides additional details.

See Table 48

How Students With Computer And/Or Adaptive Computer Technologies At Home Acquired These

By far the most common way for students to obtain computer technologies was to buy it for themselves (34%) or to have their families buy it for them (30%). It can be seen in Table 49 that provincial governments are also a likely source (25%) and that many students borrow equipment form family or friends (14%). Appendix 12 provides a listing of organizations specified by students.

See Table 49

Experiences Of Student Computer Users With Government Programs

42% of students who used a computer at home indicated that they had taken advantage of a government program to obtain at last some of their technologies (43% of English and 33% of French students).

In general, students were pleased with equipment obtained through a government program. It can be seen in Table 50 that they felt that the equipment they received was up-to-date (M = 5.04 on a 6-point scale), that it met their needs (M = 4.86), that the program was flexible in accommodating students' requirements (M = 4.27), and that contacting the necessary people to discuss one's needs was easy (M = 4.11). On the other hand, students also felt that there were many restrictive rules and regulations, that waiting periods were long, that the process for applying was complicated, and that they did not receive good training on the technology.

See Table 50

Reasons why students did not take advantage of a government program to obtain a computer or adaptive computer technologies. The majority of students (58%) did not avail themselves of a program to obtain a computer or adaptive computer technologies. When asked why, the most common answer (M=5.01 on a 6-point scale) was that students were not aware that there were any programs out there for them. In fact, when students were invited to write additional comments (see Appendix 13), many spontaneously mentioned that now that they knew that there were programs where they could apply, they would be sure to investigate their options. As is evident in Table 51, students who chose not to apply even though they knew about the availability of programs, indicated that there were too many restrictions (M = 3.57), that their family income (M = 3.33) or the nature of their disability (M = 3.27) excluded them from existing programs.

See Table 51

Table 47

Problems With Computers Noted By Computer User Students

Problems	Mean[1]	Std. Deviation
They cost too much to buy	4.80	1.50
They have to be upgraded continuously	3.87	1.75
There are few opportunities for training on adaptive technologies	3.59	1.88
There are hardware and software compatibility problems (e.g., document saved on one computer does no	3.44	1.78
Computer labs where my courses are held lack suitable adaptations for me (e.g., no dictation software)	3.38	2.14
They are frustrating / difficult to use	3.03	1.68
They crash	3.03	1.65
Manufacturers fail to support their products	2.99	1.72
They are difficult to learn	2.80	1.72
They make me dependent on them	2.74	1.81
They need to be repaired often	2.47	1.52
Using them causes me physical discomfort	2.32	1.68
They are inadequate in meeting my needs	2.27	1.51

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Table 48

Problems Using Computers At School Noted By Computer User Students

Problems	Mean[1]	Std. Deviation
Computer labs/adaptive center have always been full	3.48	1.85
There has been a lack of suitable adaptive technology for my disability	3.12	2.00
I have received insufficient training on existing adaptive technology	3.12	1.97
Using computer technologies in class makes me stand out	3.10	2.00
There has been insufficient technical support available to me	3.01	1.85
Using computer technology in class is disruptive (e.g., too noisy)	2.94	2.01
My schedule and the hours of access to computers have been incompatible	2.90	1.91
The computer programs I use at home are unavailable at my educational institution	2.75	1.95

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Table 49

How Students With Computer And/Or Adaptive Computer Technologies At Home Acquired These

Variable	Whole Sample	Students From English Institutions	Students From French Institutions
By buying it myself	34%	33%	37%
From my family who bought it for me	30%	31%	26%
Through the provincial government	25%	25%	25%
By borrowing it from my family/friends	14%	14%	10%
Through the federal government	9%	10%	3%
Through my educational institution's lending program	7%	7%	10%
Through a foundation/organization (e.g., Kiwanis Club, Neil Squire Foundation)	5%	4%	7%

Note. 608 of the 687 students who responded to this question (89%) indicated that they had a computer at home (518 of 584 English (89%) and 90 of 103 French (87%) students). Percentages refer to percent of students who have a computer at home. Some students noted several sources of funding.

Table 50

Experiences Of Computer User Students Who Took Advantage Of A Government Program

My Experience With A Government Program Has Been That:	Whole sample		English		French	
	Mean[1]	Std. Deviation	Mean[1]	Std. Deviation	Mean[1]	Std. Deviation
The equipment I received was up-to-date	5.04	1.46	5.07	1.45	4.84	1.59
The equipment I received met my needs	4.86	1.45	4.86	1.47	4.87	1.31
The program was flexible in meeting my needs	4.27	1.65	4.31	1.64	3.93	1.72
Contacting the necessary people to discuss my needs was easy	4.11	1.84	4.19	1.83	3.57	1.85
There were many restrictive rules and regulations	4.00	1.81	3.97	1.83	4.23	1.65
The waiting period was very long	3.60	1.90	3.58	1.93	3.77	1.67
The process for applying was complicated	3.25	1.84	3.28	1.86	3.07	1.72
I received excellent training on the technology	2.78	1.82	2.76	1.83	2.90	1.77
I had no say in what hardware/software I received	2.73	1.85	2.73	1.87	2.72	1.73
The evaluation process was unpleasant	2.62	1.78	2.64	1.78	2.47	1.81
The program's documentation was unavailable in a format I could read myself (e.g., no tape)	2.45	1.96	2.46	1.98	2.33	1.88

Note. Of the 627 students who used a computer at home, 262 indicated that they had taken advantage of a program and 365 indicated that they had not. (230 of 531 English and 32 of 96 French students).

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Table 51

Reasons Why Students Did Not Take Advantage Of A Government Program To Obtain A Computer Or Adaptive Computer Technologies

	Whole sample		English		French	
Reasons	Mean[1]	Std. Deviation	Mean[1]	Std. Deviation	Mean[1]	Std. Deviation
I was unaware that there were any programs out there for me	5.01	1.63	5.01	1.58	5.00	1.84
There were too many restrictions	3.57	1.99	3.59	2.08	3.50	1.63
My own/my family's income was too high for me to qualify	3.33	2.10	3.24	2.15	3.60	1.93
My disability was excluded by existing programs	3.27	1.97	3.25	2.00	3.43	1.87
The process for applying was too complicated	3.25	2.00	3.24	2.07	3.30	1.74
I/my family preferred to buy the equipment I needed	3.19	2.11	3.02	2.06	3.74	2.22
The waiting period was too long	2.70	1.83	2.67	1.89	2.87	1.64
The equipment I need was unavailable through existing programs	2.55	1.90	2.33	1.79	3.33	2.09
I did not want to take the required evaluation	2.14	1.81	2.13	1.78	2.18	1.89

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Why Students Do Not Use A Computer

33 students (5%) indicated that they did not use a computer. When asked why, their answers reflected neither computer anxiety nor difficulties in learning. As can be seen in Table 52, students indicated that computers cost too much, that computers were unavailable to them, that they were too expensive to maintain, and that it was impossible for them to get computer technologies through a subsidy program.

See Table 52

Suggestions For Adaptive Computer Hardware And Software Companies

We also asked students to make recommendations to adaptive computer hardware and software companies. It was not surprising that the most common suggestion made was to provide student discounts (79%), to make adaptive hardware and software less expensive (70%), and to provide grants to educational institutions to purchase equipment for student use (64%). Other suggestions, detailed in Table 53, stress that companies should make their products more user friendly (48%), ensure that advertising reaches students with disabilities (47%), include accessibility features for a variety of users with disabilities when designing hardware or software (41%), provide trial periods (40%), make manuals/tutorials easier to understand (38%), and provide training (38%)as well as better technical support (35%).

See Table 53

Table 52

Why Students Do Not Use A Computer

Reasons	Mean[1]	Std. Deviation
It costs too much	5.03	1.83
It is unavailable to me	4.28	2.02
It is too expensive to maintain	3.48	2.08
It is impossible for me to get it through a government program or an educational institution lending prograr	3.32	2.13
Available computers don't have appropriate adaptive hardware/software on them	3.08	1.94
The technology makes me anxious	2.93	2.12
I don't know how to use it	2.93	2.15
It is too difficult to learn	2.77	2.19
I am uncertain about where to buy it	2.72	1.88
I am not interested in using it	2.42	1.93
Adaptive technology I need to access a computer works poorly for me	2.19	1.74

Note. 33 students (5%of the sample) indicated that they did not use a computer.

[1] Responses were made on a 6-point Likert scale with, 1 = strongly disagree and 6 = strongly agree.

Table 53

Suggestions For Adaptive Computer Hardware And Software Companies In Rank Order

Suggestion	% Of Students
Provide student discounts	79%
Make adaptive hardware and software less expensive to purchase	70%
Provide grants to educational institutions to purchase equipment	64%
Make product more user friendly	48%
Ensure that advertising reaches students with disabilities	47%
When designing a piece of hardware or software, include accessibility features for a variety of users with c	41%
Provide trial periods	40%
Make manuals/tutorials easier to understand	38%
Provide training	38%
Provide better technical support	35%
Make manuals/tutorials available in alternative formats	23%

DISCUSSION

Limitations Of The Present Research

As noted in Phase III, before concluding from the findings, it must be noted that this investigation has a number of limitations.

On the positive side, we deliberately used several different methods to obtain data: focus groups, structured interviews, and broadly distributed questionnaires. We took precautions to ensure that people with all types of disabilities had the opportunity to participate. Where indicated, we used alternate formats and methods of communication (e.g., interveners for students with speech impairments in Phase I, TDD for telephone interviews in Phase II, alternate formats for questionnaires in Phase III). All phases of the investigation were conducted bilingually. The number of participants is large: close to 1000 individuals in the three studies reported. This is unprecedented in research on postsecondary education and students with disabilities. All of Canada and both college and university sectors are represented along with distance education institutions. The data gathering involved more than 200 English and French postsecondary educational institutions. The student samples are diverse in a variety of ways: age, academic programs, disabilities, and computer experiences. There are students who are "just taking courses" and students pursuing postgraduate degrees. The personnel responsible for providing services to students with disabilities who contributed data in Phases I and II also represent a broad range of colleges, universities and distance education institutions across Canada.

Nevertheless, the samples are neither random nor, we believe, fully representative of the populations studied. Given self-selection biases, we expect that the proportion of computer user students as well as of individuals who are in contact with their institutions' offices for students with disabilities are over-represented in all three phases of this investigation. Similarly, the personnel responsible for providing services to students with disabilities whom we interviewed in Phase II were also especially knowledgeable and interested in the issues. In addition, when it comes to the large numbers of students in Phase III, it should be emphasised that we mailed questionnaires to the memberships of two large consumer-based groups of students with disabilities. Yet, most students with disabilities do not belong to national or provincial student organizations.

Perhaps even more troubling, we are unable to calculate a "return rate" because of the manner in which questionnaires were made available to students. Some questionnaires were handed to students by personnel responsible for providing services to students with disabilities. Others were mailed directly to students' homes. In the overwhelming majority of cases, however, the distribution method was akin to the way in which "free" advertiser supported newspapers are distributed. For example, "Computing Canada" and "Hour," which are put in boxes or racks near entrances and exits and made available for shoppers to pick up, free of charge. In many instances, our questionnaires, too, were placed in public areas such as counters in offices providing services to students with disabilities or in computer labs, for example.

Another problematic area concerns the calculation of percentages of students with disabilities attending Canadian colleges and universities. First, it is a well known fact that not all students with disabilities choose to self-identify themselves. At this time, there is no way to determine the number of such students. The comment we heard most often was that the figures given to us reflected only those who were registered with the institution to receive special services, but there were definitely other students with disabilities on campus. Moreover, some schools considered certain conditions/impairments as disabilities that others did not. For example, some schools included students with "temporary" disabilities in their statistics, while others did not.

In many instances, personnel responsible for providing services to students with disabilities gave exact "head counts." Others, however, gave "estimates." In the case of institutions in Quebec, we relied on statistics provided in a recent survey (AQEHPS, 1999); it is possible that definitions used in this survey, which are consistent with how disabilities are defined by Quebec governmental organisations, are more restrictive than definitions used in other areas of Canada. Thus, reported percentages of students with disabilities enrolled in Quebec colleges and universities may be systematically lower than those in other provinces. This possibility, which affects both English and French schools, is one that we are investigating in a current study where the focus is on Quebec's students with disabilities.

Yet, those indices which are available suggest that the samples in our studies have characteristics which resemble the realities of postsecondary students with disabilities. The age range of students is normative for studies of students with disabilities (Fichten, et al., 1989). The sample contains more female than male students; this, too, is characteristic of postsecondary students in Canadian institutions (Statistics Canada, 1991-92). The majority of students use IBM-compatible computers. This too, is typical of postsecondary students. Even the proportion of arts and science students as well as the high proportion, about 1/3, of students with learning disabilities are characteristic of other studies of students with disabilities (Horn Berktold, & Bobbitt, 1999).

Possibly the most valuable aspect of this investigation is not the "representativeness" of the samples but the ability to answer specific questions requiring comparisons of different groups of students. What are differences between male and female students? College and university students? What about student age? What kinds of equipment do students with different disabilities need and want? What do students with specific needs find problematic and what do they find really helpful? The study's main strength lies in its ability to provide answers to such questions.

Findings Summarised

That having been said, in spite of the widely different methodologies used in the three phases of this investigation, the findings converge on a variety of important points. First, it is evident that computer, information and adaptive technologies can either enable or create barriers for students with disabilities. Generally, the perceived advantages far outweigh the disadvantages of computer technologies. In fact, most participants in the research indicated that more, more up-to-date, better, and more user friendly technologies are needed both by students with disabilities as well as by institutions having students with disabilities. What is also readily apparent from the data is that there are a variety of problems and issues that need to be addressed. These include: better funding and better information dissemination concerning funding programs for computer technologies for students with disabilities; enhanced training opportunities for students using adaptive technologies; the involvement of multidisciplinary and multisectorial decision making in the acquisition of institutional computer equipment; the education of faculty in the uses and difficulties posed by new computer and information technologies for their students; and recommendations for distributors and manufacturers of mainstream and adaptive hardware and software.

The information which follows is based on the three phases of the research. It is important to note that (1) we obtained information about institutional statistics from almost 200 institutions; (2) that Phase I had relatively few participants, but that these individuals provided very rich and complete information; (3) that Phase II interviews were conducted with only 30 personnel responsible for services to students with disabilities and 37 students; and (4) that only Phase III has a large sample, but that respondents here are exclusively students. Indeed, in future research we plan to study the needs and concerns of a much larger sample of individuals who provide services to students with disabilities in colleges and universities.

Proportion Of Students With Disabilities

Available data indicate that there are great discrepancies among institutions in the percentages of students with disabilities. To better understand the reasons for this we examined variables related to the proportion of students with disabilities. For example, the mean percentage of students with disabilities at the institutions sampled was slightly less than 3%. But this does not tell the whole story. The proportion of students ranged from no students with disabilities at all (i.e., 0%) to more than 27%. The standard deviation was very high, and the median percentage at institutions which indicated that they had at least one student with a disability was under 1-1/2%, suggesting that in most institutions fewer than 2% of students at the institution were registered with offices responsible for providing services to students with disabilities.

We tried to discover what factors were associated with the percentage of students with disabilities on campus. Our findings indicate that colleges have a higher percentage of students with disabilities than do universities. Other factors, however, such as the size of the city or town in which the institution is located or the size of the institution are not related to the percentage of students with disabilities.

What Types Of Obstacles Do Computer, Information And Adaptive Technologies Pose For Students And What Equipment Is Available In Colleges And Universities For Students With Different Disabilities?

Large numbers of students in Phase III indicated that they had difficulties with reading information on the monitor as well as with manipulating the mouse. In addition, a substantial number of students indicated problems using the keyboard, manipulating diskettes and using the printer.

Responses of personnel responsible for providing services to students with disabilities in Phase III concerning the impairments of students receiving services from their institutions indicate that almost all campuses had students with learning, hearing, visual and neuromuscular impairments. Fewer institutions however, had students with "more severe" impairments which are likely to pose greater difficulty for using computer technologies. For example fewer institutions had students who were blind than students with low vision, who used sign language rather than the oral approach, or who had problems using their hands or arms than students with mobility impairments. Over 80% of institutions which had students with disabilities enrolled had some specialized computer equipment for them.

What Kinds Of Institutions Have No Specialized Computer Technologies?

Data provided by the 30 Phase II participants who were responsible for providing services to students with disabilities indicate that all universities represented in the sample have computer, information and adaptive technologies for their students. However, only about 90% of colleges have equipment. Colleges with few students with disabilities are the ones most likely to have no equipment for their students. Universities, which generally have higher total enrollments than colleges, also have significantly more diverse populations of students with disabilities. Thus, it was not surprising to find that universities also had more specialized equipment for their students.

While only 63% of institutions reported having students who are totally blind, 84% of these, the highest number, reported having specialized computer, information and adaptive technologies for them. Institutions were also likely to have specialized computer equipment for their students with low vision Most institutions also reported having specialized computer technologies for their students with learning, mobility, and neuromuscular impairments. When it came to students with hearing impairments, however, while almost all institutions reported having students with this disability, less than 1/3 reported that they had any specialized computer equipment for these students. The types of equipment that institutions have available for students with various disabilities and impairments are described in Illustrations 1 to 6, and the types of equipment that students with different disabilities indicate they find useful is best seen in Table 39.

Computer Technologies Located at Universities and Colleges

Paying for computer technologies

Most college and university personnel responsible for providing services to students with disabilities in Phase II indicated that provincial programs funded their equipment. This was closely followed by regular institutional budgets. Nevertheless, most service providers indicated that they were experiencing problems with funding for computer, information and adaptive technologies.

How are purchase decisions made?

Most purchase decisions are made by the personnel responsible for providing services to students with disabilities after informal consultation with staff and students. Only about 1/3 of institutions make purchase decisions after formal broad-based consultation (i.e., intersectorial committees including students, computing services, audio-visual, the library, learning center, physical plant representatives, faculty, student affairs, and adaptive technologists).

Where is adapted computer equipment located?

Of those personnel responsible for providing services to students with disabilities who indicated that they had equipment for their students, approximately 1/2 indicated that this was centralized in one main location, for example, the library or the office for services to students with disabilities. The rest indicated that the equipment was decentralized (e.g., computer, information and adaptive technologies located in the library and in mainstream computer labs in a variety of locations.

Does the institution have a loan program for computer information and adaptive technologies?

Half of the personnel responsible for providing services to students with disabilities indicated that they had a loan program. There is no single model for loan programs. Duration of loans varies from, "a few hours or a day" to "duration of their studies." Most Phase II participants indicated that equipment loans are flexible and based on individual need and availability of equipment. Generally, the loan is for a short (1-4 week) period for. This is typically for a specific activity or for temporary replacement of students' own equipment, such as when waiting for an agency to provide approved equipment or when equipment is being repaired.

How available is adapted computer equipment on campus?

All institutions which have equipment make this available to students during business hours, including lunch time. The vast majority (90%) also provide access to equipment during the evening, and 81% provide weekend access.

How available is the internet?

All institutions surveyed in Phase II have internet access. Only half however, have adapted computers with internet capability. This is an important issue for students with all types of disabilities.

Students' Experiences With Computer, Information And Adaptive Technologies

The overwhelming majority of respondents in all three phases of this investigation indicated that they used a computer. For example, in Phase III, 692 of the 725 student respondents (95%) indicated that they used a computer and 87% of these indicated that they used the internet. There were no differences in the proportion of computer users between students attending English and French institutions. Proportions of computer users were similar in colleges and universities. There were very few differences between female and male students or between younger and older students. 41% of computer users indicated that they needed adaptations to use a computer (e.g., screen magnification, dictation software, Braille).

Advantages and disadvantages of computer, information and adaptive technologies for students with disabilities

Before discussing the advantages and disadvantages of computer technologies for students with disabilities two elements must be noted. First, software that is useful for students with one type of impairment may, in fact, create barriers for students with a different impairment. For example, software that creates graphics is useful for students with learning disabilities, as these facilitate visual cues to learning. Yet, this same software can create barriers for students who are blind. Second, students consider software such as spell checkers useful in enhancing their performance and in improving the quality of their work. On the other hand, they see such tools as detracting from the actual learning process.

The view expressed by participants in all Phase I focus groups is that computers can create access to information, thereby allowing students with disabilities freedom and independence. Another issue touched upon in all focus groups is that new computer technologies are changing the role of professionals working in academic institutions. Meeting the challenges posed by these changes is a task for all individuals involved in providing computer, information and adaptive technology supports for students with disabilities.

In response to the Phase II question about advantages and disadvantages of using a computer, all students who used a computer indicated advantages. When it came to disadvantages, however, almost 20% of students indicated that there were none. Similarly, all personnel responsible for providing services to students with disabilities indicated advantages. However, almost 10% of them stated that there were no disadvantages.

Advantages

The advantages of computer, information and adaptive technologies noted by students and personnel responsible for providing services to students with disabilities in Phase II show that there is good agreement: that word processing eliminates the need to handwrite and results in neat presentations; that computer technologies allow access to an abundance of information; that students can work faster with the aid of a computer; that computers provide independence empowerment and autonomy; that computers can compensate for students' disabilities; and that they allow students to easily edit and revise their work.

Overall, however, lists of students and personnel responsible for providing services to students with disabilities in Phase II were not correlated significantly because substantial numbers of individuals in both groups noted advantages that members of the other group did not mention. For example, students noted a variety of advantages that service providers did not remark upon. They noted that computers allowed them to work at their own pace and schedule - this was especially important for students with medical conditions whose energy levels fluctuated during the day. Some students also noted that the internet was cheaper than long distance. Similarly, personnel responsible for providing services to students with disabilities mentioned advantages that students did not indicate. For example, they noted that computer technologies were cost-effective, as these allowed the office for services to students with disabilities to free up human resources. They also indicated that computers level the playing field by allowing students to perform at their full potential, and that computers allow students to take their own notes in class, rather than having to rely on others or having to audiotape.

Disadvantages

The most common problem noted by students in all three phases is that computer technologies cost too much to buy. Other problems include: the need for continual upgrading, few opportunities for training on adaptive technologies, hardware and software compatibility problems, and the fact that course-related computer labs had no adaptive technology in them. The most common problem noted concerning computers located at school is that both mainstream and specialized computer labs with adaptive equipment are generally overcrowded.

Overall, students and personnel responsible for providing services to students with disabilities are in reasonably good agreement about the disadvantages of computers. Both groups of Phase II participants agreed that computer, information and adaptive technologies take a long time to learn, and that they are frustrating and not user-friendly. Similarly, both groups mentioned: the need to keep up-to-date and to be informed about new versions, changes to software, etc.; rapid obsolescence; the need for continual upgrading, and not knowing what is available. Cost, crashes, break downs, lengthy repair times, lost work, unhelpful help lines, and unsupported products are also frequently noted disadvantages. In general, participants in all three phases noted: cost, upgrades, and the need for training and/or retraining. Other issues raised by participants in all phases include concerns about the rapid changes in software and hardware, and limitations of technologies in responding to the needs of users in general and users with disabilities in particular.

However, students in Phase II also indicated that computers often fail to adequately meet their disability related needs. They noted that products are inaccurate (e.g., dictation software doesn't work well, grammar checkers work poorly), that they cannot cope with certain tasks (e.g., screen readers and voice software cannot read graphics), and that certain technologies are inaccessible (e.g., students can't control the mouse with shaky hands). Personnel responsible for providing services to students with disabilities also mentioned some disadvantages that students did not indicate. For example, they noted that computer technologies interfere with social activities, provide a false sense that the computer will solve all problems, and that use of these technologies by instructors will cause loss of human contact with students. They also mentioned lack of adequate on-campus training and tech support as disadvantages. Moreover, they noted that students can become accustomed to using hardware and software which are available on campus but unavailable elsewhere (e.g., the home, the workplace). They also noted that some students who are uncomfortable with computers are being forced to use them.

Why students do not use a computer

Ninety percent of personnel responsible for providing services to students with disabilities in Phase II indicated that there were students on their campuses who could have benefited from computer, information and adaptive technologies but who were not using these. The most popular reason indicated by these individuals was students' lack of comfort with computers. Other reasons noted were: cost, lack of awareness about what equipment is available, time, concerns about looking different from other students, and poor skills. These responses differ markedly from those provided by Phase III student participants who do not use computers.

5% of students in Phase III indicated that they did not use a computer. When asked why, their answers reflected not computer anxiety or difficulties with learning. Instead, students indicated that computers cost too much, that computers were unavailable to them, that they were too expensive to maintain, and that it was impossible for them to get computer technologies through a subsidy program.

Equipment For Students With Disabilities

All students indicated the types of computer technologies that could be useful in getting their work done. The most popular computer technologies were sophisticated features already available in popular software or mainstream equipment which students felt they needed to accommodate their disabilities. For example, the most valued technology was spelling and grammar checking, followed by a scanner and a portable note taking device that could be taken to class. Dictation software (voice recognition) and the availability of materials in electronic format (e.g., textbooks, course hand-outs) were also seen as especially useful. It should be noted that while such adaptations are likely to be useful for all students, for many students with disabilities such technologies are a necessity.

It is noteworthy that less than 60% of students in Phase III who indicated that they needed computer adaptations used them. When asked why they did not use adaptations, the overwhelming response was that it costs too much. Other reasons cited include: it is unavailable to students; they are uncertain about where to buy the technology; they don't know how to use the equipment; and equipment is too expensive to maintain.

What kinds of equipment do students who use computers actually use and where do they use them?

Data from Phase III indicate that 93% of computer users use a computer at home and 95% use a computer at school. 87% of these students use the internet. More than half of the students who use a computer use the internet at home and about 3/4 use it at school. In this regard, it should be noted that Phase II personnel responsible for providing services to students with disabilities indicated that only about 1/2 of campuses had adapted computers with internet capability. Most students in all phases who did not have a computer or internet access at home wish that they did. Similarly, although relatively few students indicated using a laptop either at home or at school, large numbers of students who do not have a laptop wish that they had one.

Most students use an IBM compatible (93%) but only 15% use a Macintosh. 7% of students use another type of computer (e.g., Tandy, Commodore). Students who use a computer at school use it most often in a computer lab (78%) or in the library (61%). A significant minority (43%) use computers in a specialized lab containing adaptive equipment. Only about 1/3 of students use computers during class lectures to take notes.

Students indicated spending approximately 13 hours during a typical school week using a computer and 7 additional hours using the internet.

The Internet

The most frequently cited reason for using the internet is doing research. Other popular reasons cited in Phase III include e-mail (friends, family and professors), accessing library materials, and entertainment.

When computer users who do not use the internet were asked why, their responses indicate that using the internet ties up the phone line, that they had no access to a computer that is equipped to go on line, and that it costs too much. No student indicated that it is unavailable in their community, and very few indicated that it was unavailable at their school.

Learning to use computer, information and adaptive technologies

Students

Most students learned to use computer technologies by themselves or through mainstream courses (e.g., Introduction to Microsoft Word is offered as an elective). Students who used adaptive equipment also indicate that they learned from an adaptive technology trainer. Students in Phase II generally felt that their method of learning works reasonably well. Personnel responsible for providing services to students with disabilities concurred with this evaluation.

Personnel responsible for providing services to students with disabilities

Most personnel responsible for providing services to students with disabilities in Phase II indicated at least two different modalities of learning about specialized computer technologies, with 3/4 of respondents indicating that they are at least partially self taught and 1/2 indicating that they learned from an adaptive technology trainer. Learning from the students was also mentioned by a substantial number of respondents. Most respondents felt that their method of learning works reasonably well. These individuals were more likely to indicate that their method of learning worked poorly if their institutions had large numbers of students with disabilities.

How students with computer and/or adaptive computer technologies at home acquired these

Most students in all three phases of this research indicated that paying for their computer technologies was problematic. Yet, it can be seen from Phase III responses that by far the most common way for students to obtain computer technologies was to buy it for themselves or to have their families buy it for them. Provincial governments are also a likely source and many students borrow equipment from family or friends. In addition, students obtained some of their computer, information and adaptive technologies through their postsecondary educational institution. This was usually in the form of being able to access the internet from home. A minority of students also benefited from equipment donated to them by a foundation or organization.

Experiences of student computer users who took advantage of a government program

42% of Phase III students who used a computer at home indicated that they had taken advantage of a government program to obtain at least some of their technologies. In general, students were pleased with equipment obtained through a government program. They felt that the equipment they received was up-to-date, that it met their needs, that the program was flexible in accommodating their requirements, and that contacting the necessary people to discuss one's needs was easy. On the other hand, students also felt that there were many restrictive rules and regulations, that waiting periods were long, that the process for applying was complicated, and that they did not receive good training on the technology.

Reasons why students did not take advantage of a government program to obtain a computer or adaptive computer technologies

The majority of students (58%) in Phase III did not avail themselves of a program to obtain a computer or adaptive computer technologies. When asked why, the overwhelming response was that students were simply unaware that there were any programs out there that could possibly help them. In fact, when students were invited to write additional comments, many spontaneously mentioned that now that they knew that there were programs where they could apply, they would be sure to investigate their options.

Students who chose not to apply, even though they knew about the availability of programs, were generally aware that policies created barriers to allowing them to obtain computer technologies. In particular, they indicated that there were too many restrictions and that their family income or the nature of their disability excluded them from existing programs. Personnel responsible for providing services to students with disabilities who participated in Phase I of the research echoed this concern.

How do students and personnel responsible for providing services to students with disabilities find out about what is currently "out there" that might be helpful?

Students

Students who use computers indicated that word of mouth, the internet and mainstream magazines are their most popular sources of information. Several Phase II students also mentioned an adaptive technology trainer as well as television.

Personnel responsible for providing services to students with disabilities

It is evident from Phase II results that the internet has become the most widely used source of information about specialized computer technologies for individuals who provide services to students with disabilities. Conferences, equipment manufacturers and distributors, and word of mouth were also popular resources.

Wish lists

Students

Students in all three phasesgenerally wanted more, better, and more up-to-date specialized hardware, software, and ergonomic furniture both at home and at school. Students who did not have home computers or who did not have adaptations at home wanted these available at home. Similarly, students who did not have internet access at home wanted this, while those who already had it wanted faster connections. Like the personnel responsible for providing services to students with disabilities, students, too, wanted user friendly voice software to control the computer and to do dictation.

Students also noted a variety of important items about computers at school. In particular, they wanted more computers at school and in the library, they wanted accessible library catalogues with printing capability, and if they did not have one, they wanted a laptop.

Personnel responsible for providing services to students with disabilities

Responses in Phase II indicate that service providers generally want more, better, and more up-to-date specialized hardware and software. Half of the respondents wanted user friendly multi-user voice software to control the computer and to do dictation. They also want students to be able to work autonomously in the library. While many mentioned that there is an adapted computer in the library, they also indicated that these computers had serious limitations. For example, they noted students had difficulty getting assistance from librarians on internet resources because the library staff were unfamiliar with adapted equipment. They also indicated that computer equipment in the library was frequently not linked to a printer, and, therefore, students could not print out information retrieved from library catalogues or internet and CD-ROM resources. Another issue noted by approximately 1/3 of respondents was decentralization of adaptive equipment. Personnel responsible for providing services to students with disabilities wanted accessible work stations in various buildings on campus and they wanted adapted equipment in mainstream computer labs in various campus buildings. Laptops, mainly for use in loan programs, were also popular.

Suggestions For Adaptive Computer Hardware And Software Companies

We also asked students in Phase III to make recommendations to adaptive computer hardware and software companies. It was not surprising that the most common suggestion made was to provide student discounts, to make adaptive hardware and software less expensive, and to provide grants to educational institutions to purchase equipment for student use. Other suggestions stress that companies should make their products more user friendly, ensure that advertising reaches students with disabilities, include accessibility features for a variety of users with disabilities when designing hardware or software, provide trial periods, make manuals/tutorials easier to understand, and provide training as well as better technical support .

Overall Institutional Evaluation Of Computer Accessibility For Students With Disabilities

What do personnel responsible for providing services to students with disabilities consider the most successful aspects of their institution's computer accessibility?

The personnel responsible for providing services to students with disabilities in Phase II most often mentioned aspects related to available equipment and to service provision. They also mentioned good access to mainstream computer labs and the internet as well as helpful and supportive computer and technical experts at their institutions.

What do personnel responsible for providing services to students with disabilities consider the least successful aspects of their institution's computer accessibility?

Unsuccessful features of their programs noted by personnel responsible for providing services to students with disabilities include inadequate funding and equipment as well as outdated software and hardware. On the human side, lack of interest and collaboration from other departments was cited. Problems also included lack of space, problematic evening access to computer, information and adaptive technologies, and lack of equipment for loans.

MAINSTREAM, FREE AND INEXPENSIVE COMPUTER, INFORMATION AND ADAPTIVE TECHNOLOGIES

There are some mainstream, "free," and inexpensive computer, information and adaptive technologies that we have come across while conducting the research on which this report is based. These have proven to be very helpful, and we decided to include them here as a useful resource

To date, we have found several products which work well on Windows computers. Our familiarity with Macs is limited, so we hope some of you may wish to share your useful and tested Mac software finds. As we live and work in Quebec, we are especially interested in Windows and Mac products which work in both English and French.

These inexpensive solutions do not, of course, replace the sophisticated, full featured adaptive products that are available. Rather, these are "quick and dirty" solutions to everyday problems without the long delays and considerable expense involved in obtaining the specialized products. All links below worked in March, 1999. Among interesting things we have found are:

Screen, Clipboard And Document Readers

TextAssist - (for Windows 3.x or Windows95)

This program was included on the CD-ROM of SoundBlaster cards bought until December 1997. It was a very good and totally cost free product for computers with SoundBlaster cards. Regrettably, SoundBlaster took it off the CD for 1998. But... if you find anyone out there with any kind of SoundBlaster card that is not absolutely the latest, you will have found TextAssist. (Discovered on the CD by Jason Lavers). Also, a new distributor was found on a posting on the EASI listserv <EASI@MAELSTROM.STJOHNS.EDU > <http://www.rit.edu/~easi/index.html>.) TextAssist is currently available for Windows 95/NT for use with any soundcard for $39.85 US from Mindmaker Inc. at <http://www.mindmaker.com/Products/ta.htm>.

Clip&Talk

Download from <http://www.at-center.com/> (for Windows 3.x or Windows95 by PC WholeWare). Clip&Talk can be used in any program which can copy text to the clipboard. The freeware version will read up to 600 words at a time. Unusual words can be added to a dictionary. A full version is $25 US shareware. (Found on Dr. G. Denise Lance's excellent web page: Virtual Assistive Technology Center <http://www.at-center.com>)

ScreenReader (successor of SuperReader)

Download from <http://www.texthelp.com/download.asp>. This screen reader for Windows95/98 is available from textHELP Systems). As each word is spoken it is highlighted. Reads menus, buttons, as well as text. The English demo (not time limited but has a reminder screen) is a free download (approx. $35 US to purchase). It will also work with ANY SAPI speech engine. Potential users must register their contact details before downloading. Find at <http://www.loriens.com/>. SuperReader also used to be available in an international version (French, Spanish, Italian, German, etc.) for $49.US, but I do not see this in the current product line-up. In Quebec, the French is definitely a plus.

ProVerbe

Find at <http://www.elan.fr/speech/> - go to the DEMO page and click the bulleted very fine print "download demo software" or the "send for a demo CD ROM" and then fill in the form) (for Windows 95/98/NT and probably for Windows 3.x by Elan in France). Free! Reads content of the clipboard. Supports English, French, German and Spanish. Can choose between a male and a female voice. Speech volume, speed and pitch are adjustable. The quality of the speech is good and better than most speech synthesizers. (Originally found on Peter Verhoeven's excellent "Welcome to the Screen Magnifiers Homepage" when you click "SPEECH" at <http://www.magnifiers.demon.nl/>)

Read To Me

Find at <http://www.pixi.com/~reader1/> (for Windows 3.x or Windows95 by the Hawaii Education Literacy Project). Free! Allows you to customize the pronunciation of mispronounced words. Reads text from the Windows Clipboard, Microsoft Word, text files, or the Internet. (Found through resources listed by Greg Gay in his module "Literacy Support Technology: Introduction" in the on-line Adaptive Computer Technologies course offered by SNOW at the University of Toronto's ATRC <http://www.utoronto.ca/atrc/>.

Make Audiotapes Without A Reader

Tape the screen reader's output

Some students have limited or no access to a computer. An inexpensive and easy solution to the problem of how to give a student with a visual impairment or a learning disability an audiotape of an assignment or an article quickly, without having to find a reader or giving the text out to a service, is to tape the screen reader's output. The SoundBlaster card as well as many other sound cards have several holes in the back. On the SoundBlaster, the first is for the speakers, and the second one is a "line out". It uses the same kind of jack as the speakers. Connect this "line out" to a tape recorder's "line in" (almost all but the smallest and cheapest tape recorders have this) and start recording. The audiotape contains whatever the screen reader reads. (Contributed by Catherine Fichten.)

Magnification Software

The Magnifier

Find at <http://www.imgpresents.com/mag.htm> (for Windows 3.x or Windows95 by Innovation Management Group). Shareware that works in a pinch for people with low vision. Magnifies the area around the mouse cursor from 2 to 10 times. Described on Peter Verhoeven's excellent " Welcome to the Screen Magnifiers Homepage" at <http://www.magnifiers.demon.nl/ >. (Contributed by Jason Lavers.)

The Loupe

Available at <http://www.magnifiers.demon.nl/ > for Windows 3.x or Windows95/98/NT - go to "download". Magnifies the area around the mouse cursor from 2 to 8 times. Described on Peter Verhoeven's excellent " Welcome to the Screen Magnifiers Homepage" at <http://www.magnifiers.demon.nl/>. (Contributed by Catherine Fichten.)

Microsoft Magnifier

If you have Windows 98 on your computer, you can probably use Microsoft Magnifier. This program provides a long horizontal box which allows text to be magnified up to 9 times. It comes on the Windows 98 CD. To get the magnifier do the following: (1) Click on Start, (2) Programs, (3) Accessories, (4) Accessibility, (5) Magnifier. Note that all components of Microsoft Accessibility must be installed (also comes with Windows 98) in order to activate Microsoft Magnifier. (Contributed by Jason Lavers.)

Small Size Voice Attachment To E-Mail

PureVoice

Download from <ftp://ftp.eudora.com/eudora/purevoice/windows/PureWin1_2_1.exe> (for Windows95 by Qualcomm). A free, mainstream program which allows the user to create and send voice e-mail using the multimedia microphone on the computer. Both sender and receiver must have PureVoice. This is available as a free standalone product. It is also included when downloading Eudora Lite. The sound quality is very good! (Contributed by Deborah Kennard)

Dictation Software

Kurzweil VoicePad for Windows: Platinum Edition

A freebie on the SoundBlaster16 CD (bought in November 1997). This is not a state of the art ViaVoice or Dragon system! It uses discrete rather than continuous speech (i.e., you... must... pause...between... words...), and has a tendency to type 88 for a large variety of words. But the price is right and at least one can get the "feel" for what dictation software can be like.

Dragon Naturally Speaking

One of the two leading dictation programs of 1999, this product can be obtained for $109 US from Dragon Systems (<http://www.dragonsys.com/frameset/product-frame.html>). But if you own Corel WordPerfect 8 Suite, you can purchase an upgrade which integrates Dragon Naturally Speaking for $39.95 US from <http://www.corel.com/products/wordperfect/wp8dragon/price.htm> .

Speeding Up Slow (And Poor) Typists As Well As People Who Transcribe Lectures In Class For Students With Hearing Impairments

AUTOTEXT in Word97

The "AutoText" feature in Word can be used to create shortcuts which typists who are captioning or writing verbatim lecture notes can use to improve their speed (also good for slow typists). The idea is that as you type the abbreviations of such words or expressions as "you" (u), "therefore" (tf), "however" (hv), or "as soon as" (sss), etc., these words will automatically convert into full words on the screen without having to use the "find and replace" function as we used to do it before. Go to "Insert", then to "AutoText" and type your own shortcuts. (Contributed by Maria-Teresa Zenteno.)

Hot Keyboard

Download from <http://www.tblabs.com/>. This small and easy to use program works on Windows 95/98 and allows you to use your keyboard to paste text and to perform macros in all of your applications and programs (i.e., create your own "hotkeys" that work in all applications). Works well! It is available as a free 21 day demo. To continue using the program you need to buy it for $ 24.95 US. (Contributed by Catherine Fichten)

Use Dos To Deal With Windows Based Word Processing Files

VIEW

This DOS based program runs in Windows 3.x and Windows 95 environments. It allows one to view, convert, print and save all types of common word processing file formats from Windows 3.x and Windows 95/98 - WordPerfect, Word (including Word97), Ami Pro, Notepad/Wordpad, Windows Write, ClarisWorks, RTF, well as HTML and ASCII/ANSI files. It is very well suited to use with speech synthesizer software for users with visual impairments. Shareware, this program can be downloaded from <http://mdrury.hypermart.net/index.html>. If you wish to keep it, a donation of $30 US should be made to the developer. (Contributed by Jason Lavers and Catherine Fichten)

Using An Electronic Agenda To Communicate - Both Day And Night

Sharp Electronic Agenda Model ZQ-1300

This tiny electronic agenda has a large screen and a great qwerty keyboard. It displays 4 lines of text and can easily be used to "talk" during casual situations. And, best of all, it has Indiglo (bright blue light that is available on many digital watches) for night illumination. Great for dim restaurants. (Contributed by Christian Genereux.)

Web Browsing Without A Mouse

Opera

Find at <http://opera.nta.no> (for Windows 3.x or Windows95/98/NT by Opera Software in Norway). This is a small (the zip file fits on a single floppy), full-featured general use web browser which supports screen magnification and is screen reader friendly. It also supports not only the mouse but also an extensive list of keystrokes. Best of all, it exists in both English and French (also many other languages such as

Spanish and Italian. It is shareware and can be evaluated free for 30 days. It costs $35 US. There is a 50% educational discount. (Contributed by Jennison Asuncion.)

Captioning Of Video And Audio Clips On An Encyclopedia

Encarta98 (both regular and deluxe)

This mainstream encyclopedia has closed captioning for both audio and video clips. (Contributed by Maria Barile.)

RealPlayerG2

Download from: <http://www.real.com/products/player/index.html?src=404>. A free audio and video player that has the option of displaying closed captions that some programs may provide for people with hearing impairments (go to Options, Preferences, Content and click the Enable optional captions box). (Contributed by Catherine Fichten.)

Portable Computing Under $400

Alphasmart

This is a lightweight (2 pounds), low-cost ($229.00 US), portable word processor with spell check, built-in LCD screen and full-size keyboard. It enables you to enter and edit text then easily transfer it to a PC or Mac for formatting and printing. It also prints directly for draft printouts. It has 8 files (64 pages of text/128 kbytes), functions on 3 AA batteries for 120 - 300 hours and has foreign language support. There is no software to install. Accessibility features are: sticky keys, key repeat control and four keyboard layouts. Canadian distributor available. A 2 week free loaner can be obtained by calling 1-888-274-2720 or e-mailing loaner@alphasmart.com. There may be specials on refurbished older models for $69 to $99 US. For more info: <http://www.alphasmart.com/>. (Contributed by Caitlin Keelan.)

In Conclusion

We hope you find the products listed here helpful. We would also like to hear about any useful products that you have found. If you have any feedback for us or if you have an interesting application or software to share, please communicate with one of us.

RECOMMENDATIONS

The nature and implications of our findings are evident. Students with disabilities can and do use computer and information technologies to help them succeed in postsecondary education. Computers are best seen as enabling technologies - "electronic curb-cuts" - that allow students with disabilities to prepare for and to participate in the knowledge based economy of tomorrow. To plan for the future rather than catch up with the past we recommend that the broadest based consultations take place at colleges, universities and organizations and agencies which provide equipment and training for students with disabilities. Such consultations must involve students, who, of course, are ultimately the end-users. Personnel responsible for providing services to students with disabilities, professors, academic computer staff, adaptive technology and computer specialists, librarians, audio-visual specialists, tech support personnel, rehabilitation professionals, college and university administrators, and representatives of various government agencies, among others, are key players in this equation. Creative partnerships and alliances are urgently needed.

What follows is a detailed set of recommendations to four groups of individuals: college and university personnel responsible for providing services to students with disabilities; professors; developers and distributors of mainstream and adaptive software and hardware; and organizations, ministries, and policy making bodies who help students with disabilities obtain computer, information and adaptive technologies.

Recommendations For College And University Personnel Responsible For Providing Services To Students With Disabilities

Make technology for students with disabilities available on your campus

Some Canadian postsecondary institutions, especially smaller colleges and campuses, have little or no computer equipment or support for their students with disabilities. As the findings clearly illustrate, computer technology is fast becoming a necessity that is levelling the playing field for students with disabilities. Campuses currently not offering computer supports for their students with disabilities need to carefully examine this situation. We hope that personnel responsible for providing services to students with disabilities will make it a priority to become better informed about what software and hardware are currently available and what some of the related issues are.

Armed with this knowledge, the job begins! Senior management at colleges and universities as well as government sources will need to be lobbied for funding to provide at least a minimal level of computer support for students with disabilities on campus (e.g., at least one computer with various adaptations as a start). Remind everyone that accessibility also includes accessibility of computer, information and adaptive technologies.

Provide off-hours access to computer technologies

Most students have academic work schedules that differ from those of the traditional "nine to five" working day (e.g., writing and doing research during the evenings and weekends). Some students also have transportation and health concerns (e.g., fluctuating levels of energy during the day). These make it critical that students with disabilities be given as much, if not more, access at school to computer technologies as their nondisabled counterparts receive.

At many postsecondary institutions, mainstream computer labs and libraries have extended evening and weekend hours to meet the needs of their students. In recognition of this reality, and keeping in mind that many students with disabilities have no equipment of their own to use off campus, personnel responsible for providing services to students with disabilities need to develop creative solutions to allow students to use equipment where it is currently housed (e.g., have students turn in their ID cards at security, have them "sign in," install a key card system). An alternative is to move computer equipment out of restrictive "nine to five" locations into less limiting ones, such as mainstream computer labs or libraries. In cases where this is not possible the institution may wish to develop a program to loan equipment to students. For example, many students commented that they would benefit from being able to use laptops to work on assignments between classes or to take their own notes in class. Some participants in our research noted that such technological solutions could not only benefit students but could also be cost-effective.

Let students with disabilities know what is available to them on campus

If equipment is to be used, students with disabilities need to be made aware of its existence. At the start of every semester, new and old students alike should be acquainted with the types of technological supports available to them, where these can be found, and when they can be used. It is important to remember that many students with disabilities have little contact with the office which provides services to students with disabilities. Therefore, "open house" or other campus wide publicity, in adapted formats, may be useful. Print announcements in college bulletins reach only a subset of students with disabilities.

There is sometimes an assumption that only certain students with disabilities will benefit from specific pieces of hardware or software. However as we have learned in our research, students with disabilities do, in fact, "cross-use" technology. For example, students who are blind and those with specific learning disabilities both reported using screen readers. Rather than assume or prescribe computer supports for students, students must be allowed to try all manner of available computer supports to decide for themselves what might work best for them. Indeed, allowing students to become familiar with the types of equipment available and to try out new types of technologies may result in creative solutions to students' computing problems.

Educate professors about effective use of computers

Professors generally don't know what kinds of things to do to ensure that students have full access to their electronic course materials [e.g., that Adobe Acrobat PDF files can have problems with accessibility for students with print impairments, that PowerPoint is problematic for some students with visual impairments, that text (.txt) versions that work in Windows don't necessarily work in a DOS environment, that students with hearing impairments will probably miss audio clips on web pages and CD-ROMs, that some students have problems in computer labs when using a mouse, etc.). They simply do not think of these issues when they are developing their courses. To help with this problem, we suggest that personnel providing services to students with disabilities consider holding a workshop or open house for professors concerning making electronic course materials accessible and useful for all of their students - inviting sophisticated computer user students with different disabilities is likely to help drive the important points home. Inserting a module on issues related to students with disabilities into regular computer courses geared toward faculty is also likely to be helpful.

Make training a priority both for students and college personnel

Lack of knowledge about how to use specialized computer technologies on the part of both students and staff who oversee the technology is an important concern. If it is to be used effectively, systematic training must be seen as part of the overall investment in the equipment itself.

Many students are intimidated by computer technologies. Others are not given the appropriate support to use it to its optimum. Rectifying this situation starts with having knowledgeable staff at the school who know how to use the equipment. Where offices responsible for providing services to students with disabilities have adaptive technology "specialists" or technicians responsible for overseeing the equipment, time and opportunities must be provided to allow them to learn to use the technologies. Periodic "in-service" workshops, demos by students or colleagues from other colleges and universities, professionals, or representatives of adaptive technology organizations and companies can provide a change of pace as well as information. Whether it is providing educational opportunities or allotting time to allow staff to learn on their own, this activity must take place.

Where adaptive technologies are located at various points and campuses, other staff (e.g., library staff, staff in computer labs) need to receive at least minimal training to enable them to assist students. Then, and only then, can students with disabilities themselves be adequately trained.

Many institutions offer students one day or half day workshops and hand-outs on the use of campus computer facilities. The same must hold true for students with disabilities. This doesn't have to be an expensive undertaking. Some students on campus have probably developed expertise in the use of specific hardware or software. Using a mentoring approach, these sophisticated students can be paired with other students who could benefit from their help. It makes sense that if there is equipment on campus, it is the responsibility of the institution to ensure that appropriate training takes place so that students can use the equipment. Putting a bunch of PCs in classrooms without offering students and faculty instruction in how to operate the equipment makes little sense for colleges and universities. The same goes for computer equipment for students with disabilities.

Include students with disabilities in all computer, information and adaptive technologies purchase decisions

To ensure that the computer technologies purchased will actually be used by students, it is vital that students with disabilities be included in the decision making process. This is particularly important since our findings indicate that needs and concerns of personnel responsible for providing services to students with disabilities are often different from those of the students. Because of the nature of their tasks, issues that are important to service providers frequently relate to institutional concerns, budgets, relations with other sections of the college or university, etc. Both student and service provider perspectives are valuable, and students can be involved in the decision making process whether the institution has a formal or an informal decision making structure for the acquisition of new technologies. What may seem "interesting" or "useful" may be "too complex" or "useless" to the students themselves. In many instances students have prior experience using computer equipment that personnel responsible for providing services to students with disabilities do not have. It is important to take advantage of this most important resource - the students themselves.

Value the opinions of students with disabilities

If equipment sits idle, there is obviously a reason. Rather than assume "lack of interest" or "lack of knowledge" on the part of students, proactive steps should be taken to evaluate the views and opinions of students on the state of equipment and support available to them on campus. Candid, non-defensive discussions can be beneficial. Anonymous yearly "formative" evaluations can also be useful in providing honest feedback. If students are dissatisfied with the equipment and support currently available to them, what better argument to take to senior administration to lobby them for better or more funding for specialized computer technology and related support?

Make purchase decisions that reflect the needs of all students with disabilities

Computer, information and adaptive technologies purchased should meet the needs of all students with disabilities. For example, an overwhelming majority of schools in our sample did not have much equipment for students who are Deaf or hard of hearing. Since these schools had high percentages of students with hearing impairments, it is obvious that more effort needs to be made to ensure that the needs of these students are met.

In this regard, it needs to be stressed that some adaptive technologies can be "cross-used" by students with different disabilities. Thus, "educated" purchase decisions can, in the long run, prove to be more cost effective. For example, screen readers, as we found, can be beneficial not only to students who are blind or have low vision but also to students with specific learning disabilities. Similarly, voice recognition software can be useful to a host of students with disabilities.

Become informed and share information on government programs offering technology-based assistance for students with disabilities

It is evident from our findings that the vast majority of students in colleges and universities are not aware of what programs exist to help them acquire computer technologies. Although students who are frequent visitors to the office for students with disabilities or to specialized computer labs may be very knowledgeable, they are not representative of all students with disabilities. Personnel responsible for providing services to students with disabilities need to seek out information about funding sources and make this available not only to the students they serve, but also to individuals who work in other sectors of the institution which come into contact with students with disabilities: for example, financial aid offices, learning centers, counselling, and health services. Additionally, personnel responsible for providing services to students with disabilities should offer assistance and guidance to students in navigating through the maze of application requirements that often accompany such programs. After all, the more equipment students have for personal use, the lower the demand on institutional resources!

Make internet access for students with disabilities a priority

Our research indicates that postsecondary institutions provide internet access to their students. However, only half of the institutions indicated that they have adapted computers (e.g., computers with screen readers) that are capable of going online. The wealth of information available to students, the fact that course material and other school related information are increasingly being put on the web, and the usefulness of e-mail are three strong reasons why providing adapted internet access is critical.

Take advantage of the experience of others

Whether you are purchasing adaptive technology for students with disabilities for the first time or not, talking to your colleagues in the field, consulting other resources, and involving knowledgeable organizations as well as individuals with expertise on campus will make the process less daunting than expected. Lessons learned at schools that are of similar size as yours, knowledge about specific government programs to tap for funds, strategies for dealing with administration, and shopping around for equipment doesn't have to be done in isolation. Other options for acquiring a "starter" adaptive computer involve entering into an equipment sharing agreement with a nearby institution, for example, or learning about institutions that are looking to donate older, but still functioning equipment.

Participants in our research indicated that the active involvement of other sectors in the institutions was a tremendous benefit in helping to provide better access to computer, information and adaptive technologies (e.g., making purchase decisions after formal broad-based consultation with intersectorial committees including students, academic computer departments, computing support services, audio-visual, the library, learning center, physical plant representatives, faculty, student affairs, and adaptive technologists).

Get involved in planning bodies responsible for institution-wide information technology purchases and systems development

Two trends are evident in postsecondary institutions. Colleges and universities are adopting policies to ensure that their campuses are networked for the new millennium. They are also experimenting with new methods of delivering education (e.g., adding computer lab components to courses, placing course materials on the web). Both of these trends have consequences that affect the types of accommodations students with disabilities will require in the near future.

Involvement with other areas of the school can have benefits both for the present as well as for the future. Personnel responsible for providing services to students with disabilities must actively make themselves aware of the institutional "agenda" concerning campus-wide information technology purchases and systems development. They must lobby, strongly, on behalf of and in partnership with students with disabilities to ensure that accessibility of new computer and information technologies is made a priority. For example, to ensure inclusion of all students in classroom activities, adaptive equipment will have to be available in mainstream computer labs and site licenses and server versions of adaptive software will need to acquired in many instances.

Possible suggestions are: push strongly to ensure that all campus internet servers and web pages meet the minimum requirements for universal accessibility [eg: the W3C site (Chisholm et al., 1999; Cast's 1999), Bobby Accessibility Checker]; make sure that a text-based browser is available; ensure that knowledgeable students and representatives of the office for students with disabilities sit on committees that review and implement campus-wide computing decisions to ensure that accessibility is always on the agenda; work with professors and academic computing staff to educate them on access issues related to internet and computer components of their courses (see recommendations for faculty for more details); influence decision makers to ensure that electronic versions of textbooks, "course-packs," and other instructional materials are made available in conjunction with print versions of the same information. These issues must be planned for and dealt with from the beginning, and not on an "ad hoc" basis, when it may be too late to do something for the student. The key point here is to work alongside, rather than separately from the campus community as a whole in addressing computer accessibility.

Recommendations For Faculty At Colleges And Universities

When planning courses which include some of the exciting new computer and information technologies, professors are generally concerned with the content of their course material as well as with the intricacies of how to best present these electronically. Class sizes vary widely, and can range from 10 to 500 students. Paradigms for how best to incorporate computer technologies into courses in specific disciplines are not yet evolved, and much energy goes into the design of electronic courseware. Regrettably, accessibility concerns of students with disabilities are simply overlooked in the planning. Even if professors were to think about accessibility issues, they are unlikely to have either appropriate information or resources at their disposal.

What follows is a list of suggestions for professors. These are by no means inclusive or highly technical. Instead, we have attempted to provide the minimal technical information that can allow professors to be "electronically welcoming" to their students with disabilities. Two helpful references, written in relatively jargon free language are by Chisholm et al., 1999 and Cooper (1999). These resources can point the way to more comprehensive information.

Ensure accessibility of your courses to all students

Most professors, when thinking of students with disabilities, think of students who use a wheelchair. Although students who use wheelchairs are present at many campuses, they are by no means the only students with disabilities who face access concerns related to computer technologies. Students with different impairments have different access issues, and even if two students have the same disability, their preferred solutions may be very different. The best thing for professors to do is to learn from their students. The professor is knowledgeable about his or her discipline and subject material. It is the student, however, who is knowledgeable about what adaptations work best for him or her. So, the first step towards making your course accessible is, "Ask the student what would be helpful."

Most professors have not considered which features of software and hardware make these inaccessible and they have little idea about how access problems could be circumvented or solved. For example, professors often don't know what to do to ensure that students have full access to their electronic course materials [e.g., that Adobe Acrobat PDF files can have problems with accessibility for students with print impairments, that PowerPoint is problematic for some students with visual impairments, that tables cause problems for software used by many students who are blind, that text (.txt) versions that work in Windows don't necessarily work in a DOS environment, that students with hearing impairments will probably miss audio clips and have problems with audio on web pages and CD-ROMs, that some students have problems in computer labs when they need to use a mouse, etc.).

Personnel responsible for providing services to students with disabilities can often advise professors about what kinds of problems exist and what kinds of solutions are available. Also, as noted earlier, students themselves often know a great deal about what kinds of technologies are helpful. For those professors who are interested in "readable," minimally technical presentations, the two resources noted earlier ("W3C Checkpoints" by Chisholm et al., 1999; and "Universal design of a web site" by Cooper, 1999) are likely to be of interest.

Put course information on the web well before the beginning of term

Putting one's course outline on the web is helpful for all students. Many students with print disabilities have to order their text books on audiotape. If the books do not exist on tape, then students must wait for someone to read the text onto tape. Since this is a time consuming process, knowing which books to order well before classes begin is likely to benefit those students who must access course materials using alternate media.

Until putting course outlines up on web pages is standardized at the institution, it would be helpful if professors were to inform the office providing services to students with disabilities when their course outline was available on the web (as well as the URL) so that students could be advised to check this information. Similarly, putting assignments, handouts, lecture notes, and practice tests, etc. on the web is likely to be useful for students who need to access print materials in alternate modalities. Needless to say, doing this is likely to benefit not only students with disabilities but all of the professor's students.

Make course-related web sites universally accessible

When designing web sites, the simpler the better. Pictures and images are problematic for students with visual impairments. These are also problematic for students with slow modems as well as for busy institutional servers. So, in general, the fewer images, the better.

Make web pages and course materials accessible to students who are blind

Of course, pictures and images of all types are totally inaccessible to students who are blind. Therefore, web pages should work well without the images. You can see what this would be like by turning off the images on your browser.

Most students who are blind use screen reading technologies to access information on the computer. Text is simply read out loud. But other web page elements, such as graphs, pictures, GIFs, animated images, etc. pose problems because the voice technology cannot recognize them. It simply does not know what to say.

Frames, too, pose problems for students who are blind, as do tables. A "no tables" version is best for students who are blind, and bulleted lists are preferred to tables. Even if information in tables is text-based, many voice technologies read words horizontally across the page. This makes tables difficult to access. If you must use tables, be sure to include a header row. In addition, detailed descriptions of graphs should be included.

In general, try to avoid Java, include "alt" tags for GIFs and small images (these are like the little yellow "tool tips" descriptions that you see when you leave your cursor on icons in Windows toolbars), use the new picture description option for complex images and pictures, and try to stay clear of Adobe Acrobat and PowerPoint presentations, which are difficult for some students to access.

Needless to say, projecting lecture notes from a web page or PowerPoint slide using an LCD projector in class does not work for these students.

Make web pages and course materials accessible to students who have low vision

Students with low vision sometimes also use voice technology. In addition, many use screen magnification. Modern mainstream programs allow for changes in font type, font size and background color, enabling students to enlarge letters and to change the contrast. Most CD-ROMs and some popular software do not do this. In particular, popular formats used on web pages, such as Adobe Acrobat (.pdf) and PowerPoint (.ppt) can cause problems.

There are a variety of free or inexpensive document reading voice technologies that allow students with some usable vision to read text and the contents of the clipboard using free and inexpensive technologies. Several of these work in either French or English (a listing for World Wide Web addresses and additional information are provided earlier in the section entitled "Mainstream, Free, and Inexpensive Computer, Information And Adaptive Technologies"). What makes these technologies interesting for professors is that they provide "quick and dirty" solutions to frequent problems such as having to make a last minute handout for a student who needs an audiotape to take away. Similarly, when a professor wants a student in his/her office to read something that is available on disk, once more the document reading voice technology can be accessed. Unless the material is scientific or highly technical in nature, these free or inexpensive technologies can read the material to the students without the assistance of a reader. Similarly, free and inexpensive magnification software can allow students to see what is on the computer screen.

Projecting lecture notes from a web page or PowerPoint slides using an LCD projector in class does not work well for many of these students either. Students who have a laptop available in class may be able to follow the lecture under certain circumstances. Discussions with the institution's computer support technicians is likely to be helpful.

Make web pages and course materials accessible to students who have hearing impairments

As noted elsewhere in this report there are relatively few computer technologies available to assist students with hearing impairments. These students have difficulty with streaming audio, audio clips, music, and the audio portion of video clips. Closed captioning (subtitles which have to be turned "on" by the user), long available on some televisions shows, have only recently been introduced into the electronic world. Regrettably, it does not yet work well.

A technological solution that works well for these students is e-mail and internet chat programs, including groupware which has "whiteboard" capability. Take note that while the student is looking at your LCD presentation, he or she cannot read you lips or look at the face and hands of an interpreter. Similarly, while working in a computer lab, the student may have difficulty looking at the screen as well as hearing your explanation about what to do.

Make web pages and course materials accessible to students with learning disabilities

These students can and do profit from all kinds of electronic and web access. Professors can help these students gain better access to their courses by ensuring that information is presented multi-modally (e.g., both picture and text). In addition, adaptations that are useful for students with low vision and with hearing impairments can also be useful for students with learning disabilities (e.g., document reader, graphics and illustrations).

Make textbooks, course materials, assignments, handouts, and exams available in alternate formats

Many students profit from electronic texts. Electronic text books, "course-packs" and electronic versions of all course materials are likely to be useful for all students. When making a disk version, most word processors can access ASCII text. When producing print materials for students with visual impairments, ARIAL 18 is the minimum font size for large print. Note that simply making an enlargement with a photocopier is not as helpful as using a larger font.

Other useful hints

Encourage students to use "virtual office hours" using e-mail. Allow students to audiotape lectures and allow them to take notes on a computer in class. Allow students to submit assignments and exams in alternate formats such as e-mail, disk, fax, and audiotape.

In conclusion

Computer technologies can enable or cause problems for students with disabilities. Little effort is required to make materials accessible to ALL students. Moreover, non disabled students are likely to benefit from the recommended modifications as well.

Recommendations For Manufacturers/Distributors Of Mainstream And Adaptive Technologies

Strive for universal access

Over the years, those working to promote access for people with disabilities have learnt two important lessons. First is the cost-effectiveness of incorporating universal accessibility features at the outset of a project. For instance, implementing accessibility features in the initial layout of a building results in fewer design, construction and, legal expenses (Falta, 1992). Not only is this cost-effective, but universal accessibility features created primarily for people with disabilities tend to benefit all people. A prime example of this is the "curb-cut" which was initially built for people who use wheelchairs and which has proven beneficial for cyclists, people on roller blades, strollers etc. Second is the need to consult with progressive and sophisticated consumer groups. These individuals' diverse backgrounds make them uniquely qualified to think of creative solutions to environmental barriers created by lack of access.

Perhaps it is fitting that the concerns and lessons related to universal access be described by Microsoft (1999).

> *"In meeting the needs and preferences of people with varying degrees of physical abilities, accessible computers and software programs can make it possible for more people to use these technologies successfully in work, education, and recreation. The number of people impacted by inaccessible computer and software design is difficult to calculate precisely, but is estimated to be over 30 million in the United States alone. Other estimates indicate that as many as 15 to 20 percent of Americans have a disability. As computers become more and more a part of everyday activities, the concern for making them truly accessible grows more critical. Already a lot has been done. Accessibility options, features, and controls have been built into software and operating systems, and a large number of accessibility aids have been developed to help people with more severe disabilities. Still there's more to do to provide equal and reasonable access to the world of computers."* (Microsoft 1999, Accessibility & Microsoft: What is Accessibility? Available June 6, 1999 on the World Wide Web: <http://www.microsoft.com/enable/microsoft/overview.htm>)

Formalize company policies and make them known broadly

Some of the recommendations below are offered by several firms on a individual basis. What we are recommending here, however, are suggestions that need to be embraced as company policies, and advertised as such. They are based on our findings and are reflective of the "higher education and students with disabilities" market.

Provide student discounts

By far the most disturbing thing we learned during our research was the exorbitant cost of much of the adaptive hardware and software on the market. Perhaps institutions and agencies are in a better position to afford this technology, and the argument that prices "may" be decreasing always exists, but there has to be an understanding that the average student with a disability simply does not have the means to acquire this technology. We strongly urge manufacturers and distributors of adaptive technology to adopt the policies that mainstream companies often do with respect to student/educational discounts or rebates. Not only is this intuitively appealing, it makes good "business" sense. If a company wishes to tap into the market that is increasingly demanding its products, and will undoubtedly need them in the future, then it must target them and make its products attractive in price. There may also be a misperception on the part of adaptive manufacturers/suppliers that students only need access to the technology at school. As our research clearly shows, this is not the case.

Another misperception is that government programs provide all necessary technology for students. Our data show that this, too, is not the case. Currently, certain disabilities are not recognized by government programs. Therefore students with one of these disabilities who could benefit from certain technologies, simply do not have the equipment available to them. Also, subsidy programs often select one of several "competing" items. Students' needs may best be met by a product not on the "approved" list.

Students need to access computer technologies whenever and wherever it is easiest for them to do so. Providing discounts for students will go a long way in helping them purchase what they need. If a company's objective is to be committed to providing accessibility to consumers with disabilities, then postsecondary students with disabilities must not be forgotten as a market.

Provide educational grants and enter into partnerships with postsecondary institutions

Again, this concept is familiar to the mainstream computer industry. It is a matter of extending such priorities to the adaptive technology industry. Personnel responsible for providing services to students with disabilities often work under budgetary constraints. Adaptive computer technology manufacturers/suppliers are often unaware of these. Schools must frequently make do with older out-of-date equipment because of lack of funds to buy new hardware/software. Given the robust findings concerning the need for on campus computer supports for students with disabilities, manufacturers/suppliers need to play their part by providing educational grants to schools that wish to purchase equipment for their students. For many schools, needed equipment is well beyond the cost that can be justified to administration.

We suggest that adaptive suppliers/manufacturers enter into partnerships with schools and provide equipment at an "educationally friendly" cost, along with the necessary support in the form of comprehensive staff training and dedicated technical back-up. Personnel responsible for providing services to students with disabilities need to become more familiar with adaptive technologies if they are going to make these available to their students.

As colleges and universities move toward adopting policies to ensure that their campuses are networked for the new millennium, and as they experiment with new methods of delivering education (e.g., adding computer lab components to courses, using LCD projection in class, placing course materials on the web), expertise from adaptive technology suppliers/manufacturers on how their equipment can be interfaced with these new learning technologies is urgently needed. What's in it for the company? A generation of computer users who have mastered your products as well as a valuable testing site for new adaptive technologies.

Target advertising to the students

One of the major concerns noted in all phases of our research is that people did not know what products are available or where to purchase these. This clearly speaks to the lack of visibility manufacturers/suppliers of adaptive technology have in the higher education community. Therefore, we recommend that a more concerted effort be made to target advertising specifically to this market, i.e., not only to the professionals, but to the students who ultimately are the end-users. Suggestions include holding technical open houses at the start of fall and winter academic terms in cities with colleges and universities; contacting schools to arrange for on site visits to demonstrate new products to students and to staff; and appearances at conferences such as that of the National Educational Association of Disabled Students (NEADS) where the intended market is likely to be reached. What we are suggesting is that both visibility and integration into the higher education community is needed. Again, companies would gain valuable feedback concerning the unique characteristics and needs of this "particular market". One respondent suggested using students as beta testers. This would definitely be a good start!

Provide trial periods

If a student or institution is willing to invest in sophisticated technology, they should be given the opportunity to try out the product for a reasonable period (e.g., two weeks to one month) in their own "environment" prior to purchase. During a demonstration, equipment often works well. But once used in an actual school setting (e.g., scanning course hand-outs, trying out voice recognition software), the results may be disappointing. In this way, individuals can choose which product is best suited to their needs without having to make a sizeable and potentially disastrous investment. This is how ill feelings are avoided and product loyalties are forged.

Provide superior, timely, and free training as well as technical support

Our research shows the need for better training and technical support. What was especially dismaying was that some respondents indicated that not only was there an expense in buying the actual equipment but, in addition, individuals had to pay for training and technical support. Receiving "on site" assistance with installation would be a considerable improvement from having to follow what can oftentimes be confusing written or telephone instructions.

The job of students is to keep up-to-date with their academic pursuits, rather than to act as computer technicians. Training and technical support should not be viewed as a privilege. Rather it should be considered a part of the responsibility a company has to its client. As noted earlier, the higher education community has unique demands. One of these happens to be timeliness.

Make hardware and software more user friendly

The longer it takes to understand command structures, equipment installation procedures, etc., the less likely it is that the equipment will be used. The easier a product is to use, the higher the customer's satisfaction. In essence, postsecondary students with disabilities and the staff who oversee the equipment for these students are likely to stick with a company that provides equipment that is easy to use.

Make manuals/tutorials easier to understand, and make them available in a variety of alternate formats

Unintelligible manuals and tutorials used to plague the computer industry as a whole. In the field of adaptive technologies, the problem has, in many cases remained. Students with disabilities rarely have leisure time to sort through unintelligible instructions. What is needed is clearly written information that is easily indexed to allow users to find information. Training tutorials could follow well documented instructional models. For example, providing practice exercises to go along with the didactic material. Simply providing sequences of commands is insufficient. Moreover, it goes without saying that making material available in alternate formats to meet the needs of the customers is vital. For example, it is pointless to furnish manuals for a screen reader on diskette when the individual will need to know how to use the screen reader to access it. This is an area where companies can learn from the educational institutions themselves, which are, for the most part, committed to providing materials in suitable alternate formats. Companies who charge for providing materials in alternate formats should reconsider and revise this policy.

Continue to create possibilities for mainstream hardware to interface with adaptive software

We applaud current efforts to integrate mainstream and adaptive products. For example, new screen reading software that is compatible with existing sound cards decreased costs substantially. This trend needs to continue!

Technology created for people with specific needs may be useful to the majority of people. One should consider however, that equipment will not be purchased if it is not affordable. What is the point of manufacturing specific technology if it is too expensive to be used by those for whom it is designed? Less expensive solutions will be purchased by more customers.

Recommendations For Organizations, Ministries, And Policy Making Bodies Who Help Students With Disabilities Obtain Computer, Information And Adaptive Technologies

Perhaps the single most outstanding finding of our studies relates to students' concerns over the cost of computer, information and adaptive technologies. Regardless of what question was asked or how it was formulated, the high cost of acquiring and maintaining computer technologies was the single most important and common issue noted by computer users and non-users alike. The majority of students who had computer equipment at home indicated that they or their families had paid for these. When asked why they did not take advantage of a government program to help them obtain a computer or adaptive technologies, the single most popular answer was that students simply did not know about the existence of such programs. The solution to the problem is obvious: organizations/agencies that provide money, loans or computer technologies to students with disabilities need to do more effective "outreach." More broadly based information dissemination to better inform students (in alternate formats), financial aid offices, postsecondary personnel responsible for providing services to students with disabilities, and rehabilitation professionals about available opportunities is clearly needed.

Make the postsecondary education community more aware of the programs available to them

Clarify and make transparent the rules and criteria for eligibility

Simplify the application process and make application information and forms available in alternate formats

Our research clearly shows that both students with disabilities as well as personnel responsible for services to students with disabilities are poorly informed about government programs which help students acquire computer, information and adaptive technologies. Specific rules and eligibility criteria for programs are also not well known even by individuals who are aware of the existence of specific programs.

To rectify the situation, we recommend that agencies make the effort to inform the postsecondary education community about the full range of programs, the rules and regulations, and the eligibility criteria. Provide all information that could be helpful to potential applicants and to the personnel at colleges and universities who advise students with disabilities concerning financial matters.

Information packages should be sent to national and provincial organizations for students with disabilities as well as to college and university personnel responsible for services to students with disabilities for broad based dissemination to students and to other concerned professionals (e.g., financial aid officers). Material should be made available, of course, in alternate formats (i.e., Braille, tape, diskette, regular and large print). Information should also be posted on web sites, and the location widely publicised.

Site visits by program officials to meet with students and with personnel responsible for services to students with disabilities would also be useful. An orientation to government assistance programs which relate to computer technologies at conferences for the postsecondary education community would also be helpful.

Standardise federal funding programs for computer technologies across the country

At present, for the same federal programs, there are large discrepancies in funding levels and criteria between provinces. Thus, the nature of a student's disability and the part of the country in which he/she resides can have an important impact on access to funding for technology. We recommend a review of current practices with a view to ensuring equal access to federal funding for technological support for postsecondary students with disabilities across the country.

Leverage computer infrastructure grants to postsecondary institutions by insisting on accessibility of computer technologies purchased in supported projects

When federal or provincial governments provide funds to purchase computers or to experiment with new learning technologies, funding should be conditional on meeting specific provisions for ensuring that equipment purchased with government funds contain appropriate accessibility features. A "watchdog and monitoring" body can be set up to scrutinise applications for compliance with accessibility criteria.

It is clear that we are moving into an exciting age where new learning technologies and the internet are providing educational possibilities that did not exist before. What makes these developments troubling to us is the absence, in many cases, of planning for access by students with disabilities. The implications of this omission are obvious. New technological barriers are slowly being erected where others have fallen. Rather than paying lip service to the idea of accessibility, government funding bodies need to take tangible steps. For example, asking for a detailed outline of steps taken to ensure accessibility for students with disabilities on grant applications and taking responses to this question into consideration in the review process is likely to be helpful.

Another possibility is to use an incentive plan to ensure that Canadian business and industry develop and market new products and technologies that are accessible to students with disabilities.

Treat different impairments on equal terms

To encourage equity in education, government programs need to recognize all impairments on equal terms. College and university personnel working with students who have disabilities are often limited in their ability to provide computer, information and adaptive technologies to students with specific impairments due to lack of funding for students with specific disabilities. This limits students with "unrecognised" impairments in the pursuit of higher education.

Shorten waiting periods and fund training

Courses at colleges and universities have firm start and end times. Exams and assignments are scheduled with fixed dates. Students who need to use computer, information and adaptive technologies must be able to access these in a timely manner. Our data suggest that waiting periods in many government programs are simply too long to meet the needs of postsecondary students with disabilities. Shorten waiting periods and ensure that equipment and training are consistent with the needs of students in colleges and universities.

CONCLUSIONS

Our approach to the conceptualization of computer, information and adaptive technologies is that it is environmental factors and accessibility features of computer and information technologies that form either facilitators or barriers to students with disabilities. For example, environmental factors can either be barriers (e.g., printed material for people who have print disabilities), or facilitators (e.g., printed material for people with hearing impairments). Of course, the same environmental factors can either be "facilitators" or "barriers" (e.g., public address systems at airports are facilitators for people with visual impairments but can be barriers for people with hearing impairments. Social, political, and environmental aspects of funding programs for students with disabilities can create both access as well as exclusion.

When reviewing the commonalties among all samples studied in this investigation it is evident that the potential of computer, information and adaptive technologies to remove barriers to students with disabilities is enormous. Nonetheless, environmental barriers are continually being created. It is imperative that solutions are identified and implemented while the technologies and their implementation in postsecondary educational institutions are still in a developing stage.

Environmental factors have been implicated in denying people with disabilities goods and services as well as education (cf., Whiteneck & Fougeyrollas, 1996). Participants in our research seemed aware that many present educational policies dealing with students with disabilities act as "barriers" rather than "facilitators" in determining access to education for students with disabilities by denying them access to what is rapidly becoming a necessity for students in colleges and universities. Computer, information and adaptive technologies are no longer a luxury to assist a few privileged individuals. Current trends in postsecondary education make it virtually impossible for students to complete their education if they have no access to computers or to the internet. The main problems with policies arise from the fact that, as noted by Lemieux-Brassard (1996), there are discrepancies between the intent of the policies and how they are applied.

Many policies reflect the view that problems originate from within the individual rather than arising from the environment. The approach taken, therefore, is to try to remediate or to provide accommodation for individual impairments rather than to locate the problem in the environment and the prevailing social structure. If one takes the latter approach, as suggested by both the Social Model of Disability and the Environmental Factors Model (Oliver, 1990; Oliver, 1996; Swain, Finkelstein, French, & Oliver, 1996; Whiteneck & Fougeyrollas, 1996), then the environment is the problem and it is the environment that must be "remediated." Unless there is a shift away from the current person-centered ideology toward a broader, more systemic view then students with disabilities will continue to be denied full access to postsecondary education because computer and information technologies will continue to be designed and built with inaccessible features. Substantial effort must be undertaken to educate manufacturers of computer technologies as well as to formulate and implement strong federal legislation, similar to that now in effect in the United States regarding technology, to render technologies accessible.

The enormous potential of computers to remove barriers to students with disabilities and concerns over barriers posed by limitations in access were central issues noted by respondents in all categories in all phases of the research. Implicit is the message that various groups need to work together to ensure better access. This includes: industries that design and build software and hardware; policy makers who create laws regarding information technologies; policy makers who plan programs which provide access to computer technologies for students with disabilities; educational and government administrators; "front line workers" who provide information to students with disabilities; and, most important, consumers with disabilities.

Elsewhere we made concrete recommendations for specific groups whose collaboration is vitally needed in the postsecondary education milieu. These people and organizations all have a role in ensuring that computer technologies are accessible and affordable. If the access issues noted by our participants are not addressed and if changes in existing policies and procedures are not made, we will approach the next millennium with a technological society wherein people with disabilities will again be segregated by virtue of an inaccessible environment. This, must be avoided at all costs!

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Adaptech Project - Dawson College - Montreal

Learning Technologies: Students With Disabilities In Postsecondary Education

Appendix

Final Report to the Office of Learning Technologies
Spring, 1999

Office of Learning Technologies
Bureau des technologies d'apprentissage

The OLT ... Your Partner in Lifelong Learning
Le BTA... votre partenaire pour l'apprentissage à vie

This project was made possible with funding support from the OLT.

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Learning Technologies: Students With Disabilities In Postsecondary Education

Appendices to the Final Report to the Office of Learning Technologies

Catherine S. Fichten, Ph.D.
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Jennison V. Asuncion, B.A. (With Distinction)

Adaptech Project
Dawson College
Montreal, Canada

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Appendix 1

Accomplishments: Team CV

cvteam.doc June 28, 1999

ACCOMPLISHMENTS OF ADAPTECH RESEARCH TEAM

1996-present

The Adaptech Project consists of a team of academics, students and consumers conducting research on the use of computer, information and adaptive technologies by Canadian college and university students with disabilities.

CORE RESEARCH TEAM

Catherine S. Fichten, Ph.D. (Dawson College, Jewish General Hospital, McGill University): Project Director
Maria Barile, M.S.W. (Dawson College): Project Co-Director
Jennison Asuncion, B.A. (with distinction) (M.A. Candidate, Concordia University, VP: National Educational Association of Disabled Students "NEADS"): Research Associate

Iris Alapin, B.Sc. (M.A. Candidate, Concordia University): Research Assistant
Myrtis Fossey, D.E.C. (B.A. Student, McGill University): Research Assistant
Christian Généreux, D.E.C. (B.A. Student, Université du Québec à Montréal): Research Assistant
Jean-Pierre Guimont, M.Ed. (Information Specialist and Head - Audio/Visual Production, Dawson College): Resource Person
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Jason Lavers, B.A.: (Montreal Association for the Blind, Dawson College) Research Assistant
Evelyn Reid, D.E.C. (B.A. Student, Concordia University): Research Assistant
Chantal Robillard, B.A. (M.A. Candidate, Université du Québec à Montréal, Dawson College): Research Assistant
Fay Schipper, M.Ed. (Volunteers Coordinator, Mackay Center): Resource Person

PRESENCE ON THE INTERNET

Web Site: http://omega.dawsoncollege.qc.ca/adaptech
Moderated Listserv: ADAPTECH. Subscribe by sending mail to: Jennison Asuncion at adaptech@concordia.ca

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Asuncion, J.V., Lavers, J., Barile, M., Maggiore, V., Guimont, J.P., Schipper, F., & Fichten, C.S., (1998). **Selected computer, information and adaptive technologies for students with disabilities: A demonstration.** Presentation at the EvNet Conference, Montréal, Québec. Abstract available at http://socserv2.mcmaster.ca/srnet/confabstracts/selected.htm

Asuncion, J. Fichten, C.S., Barile, M., Alapin, I., & Lavers, J. (1998, April). **Computer, information and adaptive technologies in postsecondary education.** "Round-Robin" presentation at the 3rd International ACM (Association for Computing Machinery) SIGCAPH (Computers and the Physically Handicapped) Conference on Assistive Technologies: ASSETS '98, Los Angeles.

Asuncion, J. & Vida, S. (1999, May). **Promoting accessible post-secondary education for students with disabilities.** Presentation at the 1st World Congress of Colleges and Polytechnics, Quebec, Quebec.

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Barile, M. & Fichten, C.S. (1997). Computer and information technologies for postsecondary students with disabilities: Research in progress. Presentation at the annual convention of the Association pour la recherche au collégial, Montréal, Québec. Abstracted in **9e colloque de l'ARC: Programme,** 9. Available at World Wide Web URL: http://www.cyberus.ca/~arc/programme.html

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Fichten, C.S., Barile, M., Asuncion, J., Judd, D., Alapin, I., Reid, E., Lavers, J., Généreux, C., Guimont, J.P., & Schipper, F. (1999, March). **A comparison of postsecondary students with disabilities and service providers: Views about computer and information technologies.** Presentation at the annual conference of CSUN (California State University, Northridge): Technology and persons with disabilities - Where assistive technology meets the information age. Los Angeles.

Fichten, C.S., Barile, M., Asuncion, J.V., Judd, D., Lavers, J., Havel, A., Wolforth, J., Alapin, I., Maggiore, V., & Bailes, S. (1998, July). Computer and information technologies: Student and service provider perspectives. Presentation at the annual conference of the Association on Higher Education and Disability (AHEAD), Las Vegas, Nevada. Summarized **in Conference Program AHEAD '98,** p. 32. Abstracted in **Conference Abstracts AHEAD '98**, p. 29 (Abst. No. T13). Published on audiotape: (#T13): **Visual Aids Electronics**, 202 Perry Parkway, #5, Gaithersburg, MD 20877.

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Fichten, C.S., Généreux, C., Asuncion, J.V., Lavers, J., Guimont, J.P., Barile, M., & Alapin, I. (1998, June). **L'utilisation de technologies d'apprentissage informatiques et adaptées, gratuites et non spécialisées pour enseigner aux étudiants handicapés / Using mainstream and "free" computer, information and adaptive technologies to teach students with disabilities.** Presentation at the annual conference of the Association pour les applications pédagogiques de l'ordinateur au postsecondaire (APOP), Ste-Foy, Québec.

Fichten, C.S., Généreux, C., Lavers, J., Fossey, M., & Asuncion, J. (1999, April). **Atelier informatique avec Adaptech / Computer workshop with Adaptech.** Invited presentation at the Assemblée générale annuelle de l'Association Québécoise des étudiants(es) handicapés(es) au post secondaire (AQEHPS).

TALKS AND PRESENTATIONS

Asuncion, J. (1997, June). **Blind and print disabled library users speak out about what works for them.** Invited panel member at the Preconference Session of the Canadian Library Association Convention - Making Connections, Ottawa.

Asuncion, J.V. & Fichten, C.S. (1999, April). **Adaptech Project: Part I.** Interview on EASI Roundtable Webcast. Posted April 29 on the EASI web site <http://www.rit.edu/~easi>. Available April 29, 1999 on the World Wide Web: <http://tlt-easi.com/realmedia/adaptech1.html>.

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TALKS AND PRESENTATIONS (continued)

Asuncion, J.V. (1998, Nov.). Invited panel member. **Educational Association of Disabled Students (NEADS) and Association québécoise des étudiants handicapés au postsecondaire (AQEHPS) Provincial Town Hall Meeting.** Montréal, Québec.

Asuncion, J.V. (1998, February). **Enabling technologies and students with disabilities in postsecondary education.** Presentation at the Concordia University Dept. of Education Student Symposium, Montreal, QC.

Asuncion, J.V., & Rosler, D. (1998, February). **The Teacher Forum: A web-based resource for teachers.** Demonstration at the Concordia University Dept. of Education Student Symposium, Montreal, QC.

Barile, M. (1999, Jan.). **Issues of persons with disabilities, with an emphasis on women with disabilities.** Guest lecture for the Social Service Program, Dawson College, Montréal.

Barile, M. (1997-1999). **Sexual assault and women with disabilities.** Bi-yearly guest lectures at the Sexual Assault Center, McGill University, Montréal.

Barile, M. (1997). **Feminism and disability: A standpoint perspective**. Presentation at the Women's Studies Programme, McGill University, Montréal, QC.

Barile, M., Judd, D. Millin, R. & Schipper, F. (1998). **Perspective of the client and the health care provider**. Panel members, Health Care and Professionalism III, Physical and Occupational Therapy Programs, McGill University, Montreal, QC.

Fichten, C.S. & Généreux, C. (1999, May). **Accommodating the needs of postsecondary students with disabilities: Teaching and research guidelines.** Presentation at the Fourth EvNet Conference, Sackville, New Brunswick.

Fichten, C.S., Généreux, C., Barile, M., & Asuncion, J. (1999, May). **Findings about computing needs of postsecondary students with disabilities.** Presentation at the Fourth EvNet Conference, Sackville, New Brunswick.

Fichten, C.S., Lavers, J., Barile, M., Asuncion, J., Généreux, C., & Robillard, C. (1999, May). Les technologies informatiques et d'apprentissage conventionnelles et adaptées. Home page of **La Vitrine APO (Applications Pédagogiques de l'Ordinateur)** Available May 12, 1999 on the World Wide Web: <http://vitrine.ntic.org/vitrine/veille/textes/adaptes.html>.

Fichten, C.S. (1998). **Perspective of the client and the health care provider**. Panel chair and organizer, Health Care and Professionalism III, Physical and Occupational Therapy Programs, McGill University, Montreal, QC.

Fichten, C.S. (1997, May). **Témoignage sur la recherche au collégial et ses impacts.** Invited keynote presentation at the annual convention of the Association pour la recherche au collégial, Montréal, Québec.

Fichten, C.S., Barile, M., Asuncion, J.V., Judd, D., Alapin, I. & Lavers, J. (1998, May). Computers and students with disabilities in postsecondary education: Research in progress. Presentation at the Research Fair of the Centre for the Study of Learning and Performance, Concordia University, Montreal, Quebec. Abstracted in **Research Fair - Centre for the Study of Learning and Performance**, p.9. Aug., 1998. Montréal: Concorida University.

Fichten, C.S., Généreux, C., Barile, M. & Lavers, J. (1999, June). **Using computers effectively when teaching students with disabilities.** Presentation at the annual meeting of the Anglophone Service Providers for Students with Disabilities, Dawson College, Montréal, Québec.

Généreux C., (1998, December). **Les étudiants ayant des incapacités: Un regard statistique**. Presidential address at the Colloque annuel de l'Association québécoise des étudiants handicapés au postsecondaire (AQEHPS), Montreal, Quebec.

Généreux C., (1998, November). Workshop panel member: **Accessing funding to support post-secondary study.** National Educational Association of Disabled Students (NEADS) Biannual Conference. Ottawa, Canada.

Maggiore, V., Lavers, J. & Fichten, C.S. (1997). **Teaching and learning via the Internet: The virtual college classroom.** Presentation at the Dawson College Open House, Montréal, Québec.

Schipper, F. (1999, Feb.). **Professionals and their clients with disabilities: Making a difference / A personal account: My life with CP.** Presentation at the 13th conference of OPSEP, McGill University, Montreal, QC.

Schipper, F. (1999, Jan.). **Volunteering at Mackay Center**. Presentation at Trafalgar School, Montréal, QC.

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THESES

Lanoue, N.A. (under the supervision of C.S. Fichten) (1999). **Learning technologies and students with disabilities in post secondary education: Role of age, sex, and prior experience**. Undergraduate thesis, Concordia University.

Leblanc, A. (under the supervision of C.S. Fichten and D. Massé). (in progress). **The socio-economic development of college students with physical disabilities - a case study.** M.Ed. thesis, Faculty of Education, Université de Sherbrooke.

HONOURS

Asuncion, J. (1999). **Council of Canadians with Disabilities (CCD)**: Award for outstanding contribution to the work of the National Educational Association of Disabled Students (NEADS).

Asuncion, J.V. (1998, Nov.). Co-host: Opening plenary. **National Educational Association of Disabled Students (NEADS) Biannual Conference.** Ottawa, Canada.

Asuncion, J.V. (1998, Nov.). Co-moderator of session: Developing a national approach to the provision of accessible post-secondary education. **Educational Association of Disabled Students (NEADS) Biannual Conference**. Ottawa, Canada.

Asuncion, J.V. (1998). Member: Organizing Committee. **National Educational Association of Disabled Students (NEADS) Biannual Conference.** Ottawa, Canada.

Asuncion, J.V. (1998). Member of the 1998 **Concordia University Department of Education Student Symposium Organizing Committee**. Concordia University, Montreal.

Asuncion, J.V. (1996-1998). Vice-President Internal & "Open Representative" on the Board of Directors: **National Educational Association of Disabled Students (NEADS).** (1998-1999: Acting Vice President, Internal). Ottawa.

Asuncion, J.V. (1997). Canadian delegate to the 1997 Summer Adult International Leadership and Disability Rights Exchange Program, **Mobility International USA**. Eugene, OR.

Barile, M. (1999-2001). Consultant: **Canadian Centre on Disability Studies**. Project title: Assessments tool and handbook on best practices: When people with disabilities apply technologies to paid work.

Barile, M. (1994-present). Member of the Editorial Board of **Action,** the bilingual newsletter of the Disabled Women in Action des Femmes Handicapées,

Fichten, C.S. (1999- present). Appointed to the **Board of Directors of the Association Québécoise des étudiants(es) handicapés(es) au post secondaire (AQEHPS)**

Fichten, C.S. (1998-1999). Member of the 1999 **American Psychological Association, Division 22 Conference Program Committee.**

Fichten, C.S. (1998-1999). Member of the 1999 **Association for Advancement of Behavior Therapy (AABT)** Conference Program Committee.

HONOURS (continued)

Fichten, C.S. (1993-1999). Member of the Editorial Board of the **Journal of Postsecondary Education and Disability.**

Fichten, C.S. (1996-1998). Guest reviewer for the following scholarly journals: **Canadian Journal of Rehabilitation, Journal of Behavioral Medicine, Journal of Clinical Child Psychology, Journal of Consulting and Clinical Psychology, Journal of Psychosomatic Research, Journal of Postsecondary Education and Disability, Journal of Social and Clinical Psychology, Psychology and Aging.**

Fichten, C.S. (1996-1998). Reviewer of grants as an external expert: **Fonds pour la formation de chercheurs et l'aide à la recherche (FCAR), Fonds de la recherche en santé du Québec (FRSQ)**

Fichten, C.S. (1998). Named Associate Editor of the **Canadian Journal of Rehabilitation**.

Fichten, C.S. (1997). **Prix de l'A.R.C. pour Contribution au Développement de Carrières Scientifiques.** Prize jointly awarded by A.R.C., Faculté des Sciences de l'Education de l'Université de Montréal, and the CEQ for extraordinary contribution to the scientific careers of students and young researchers.

Fichten, C.S. (1997). Member of Awards Jury: **Association on Higher Education and Disability (AHEAD) Meeting the Challenge Award** (innovative application of adaptive/assistive technology).

Fichten, C.S. (1997). **Second Japan Conference of the Association on Higher Education and Disability (AHEAD),** Tokyo, Japan. Invited as the keynote speaker.

Fichten, C.S. (1997). **Témoignage sur la recherche au collégial et ses impacts.** Invited keynote presentation at the annual convention of the Association pour la recherche au collégial, Montréal, Québec.

Fichten, C.S. (1996-1997). Member of the 1997 **Association pour la recherche au collégial (ARC) Conference Program Committee.**

Généreux, C. (1998-1999). Président de **l'Association québécoise des étudiants handicapés au postsecondaire (AQEHPS).** Montréal, Québec.

Généreux, C. (1998-1999). Vice-président du conseil d'administration de **l'Association des étudiants handicapés de l'UQAM (ADEHUQAM).**

Généreux, C. (1997-1999). Membre du conseil d'administration: **Nous nous intégrons en commun (le NIC).**

Généreux, C. (1995-1999). Membre des comités scolaire et aides techniques à la **Confédération des organismes de personnes handicapées du Québec (COPHAN).**

Généreux, C. (1996-1998). Vice-président de **l'Association québécoise des étudiants handicapés au postsecondaire (AQEHPS),** Montréal, Québec.

Généreux, C. (1995-1996). Trésorier de **l'Association québécoise des étudiants handicapés au postsecondaire (AQEHPS),** Montréal, Québec.

Guimont, J-P. (1998). Appointed Contributing Editor: **Web Support Line: A publication to inform the Dawson Community about the potential of the Internet and the World Wide Web.** http://www.dawsoncollege.qc.ca/text/WebSupport/index.html

Judd, D. (1999). Participant in a commercial for the **Montreal Association for the Blind**, Montreal, QC.

Robillard, C. (1996 - present). **Collaborator on the answering committee of the sexology web site "Elysa."** Université du Québec à Montréal.

Robillard, C. (1998). Assistant with the swimming competition for participants with disabilities: **Défi sportif 1998.** Montréal, Québec.

Robillard, C. (1998). Delegate: **Comité des affaires sociales, et culturelles de Singapour: Une simulation des Nations Unies** (McMUN 1998), Université du Québec à Montréal.

Schipper, F. (1996-present). Vice Chair of the adapted sailing association: **Association québécoise de voile adaptée (AQVA).** Montréal, Québec.

Schipper, F. (1997). Certified as an "**Administrator of Volunteer Resources - CAVR**" by the Canadian Administration of Volunteer Resources.

AWARDS AND GRANTS

Medical Research Council of Canada 1999-02
Daytime functioning and sleep disorders in older adults
(awarded to Libman, E., Schondorf, R., & Fichten, C.S.)

Social Sciences and Humanities Research Council (SSHRC) 1996-01
Strategic Research Networks
Network for the Evaluation of Education & Training Technologies (EvNet).
[awarded to C. Cuneo (Network Leader) and Abrami, P. C., Conrath, D.W., Campbell, B., C.S. Fichten, LaFranco, S., Harnish, D., Holt, P., Procter, M., Schmid, R., Webster, J., & Wright, R.]

Programme d'aide à la recherche sur l'enseignement et l'apprentissage (PAREA) 1998-00
Access to college for all / l'Accessibilité au cégep pour tous
(awarded to C.S. Fichten)

Fonds pour la formation de chercheurs et l'aide à la recherche (FCAR) 1997-00
Soutien aux équipes de recherche (awarded to S. Sabourin, J. Wright, Y. Lussier, C.S. Fichten & C. Bélanger)

Social Sciences and Humanities Research Council (SSHRC) 1999
Challenges and Opportunities of a Knowledge-based Economy
People with disabilities in the knowledge-based economy
(awarded to C.S. Fichten, P. Abrami, R. Amsel, M. Barile, & J. Wolforth)

Human Resources Development Canada 1999
Challenge '99 Grant (awarded to C.S. Fichten)

Le Comité d'adaptation de la main-d'œuvre pour personnes handicapées (CAMO) 1998-99
Work integration
(awarded to C. S. Fichten and M. Barile)

Office of Learning Technologies 1997-99
Learning Technologies and Students with Disabilities in Postsecondary Education
(awarded to C.S. Fichten and M. Barile)

Office des personnes handicapées du Québec 1996-99
Volet CIT - Integration au Travail
(awarded to C.S. Fichten)

Human Resources Development Canada 1998
Challenge '98 Grant (awarded to C.S. Fichten)

Conseil Québécois de la recherche sociale (CQRS) 1997-98
Women with disabilities
(awarded to M. Barile & C.S. Fichten)

Direction générale de l'enseignement collégial (DGEC) 1997-98
Programme d'aide pour les applications pédagogiques des NTIC
Uniformity and diversity in the classroom: The role of the new technologies on information and communication
(awarded to S. d'Apollonia, R. Bourgeois, H. Elizov, C.S. Fichten, B. Geslain, J. Guerriero, J.P. Guimont, J. McGill, Z. Szigetvari, & H. Wehden)

Dawson College 1997-00
Adaptation to Technological and Programme Changes
Educational computing and network for the evaluation of educational technology
(awarded to C. S. Fichten)

Direction générale de l'enseignement collégial (DGEC) 1995-97
Programme de soutien aux chercheurs de collèges (PSCC)
(awarded to C.S. Fichten)

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Appendix 2

Advisory Board Members

oltnam.xls	3-May-99	e-mail	comments
ADVISORY BOARD			
Dr. Phil Abrami	Concordia University, LB-581, 1455 de Maisonneuve W., Montreal, QC, H3G 1M8	pabrami@alcor.concordia.ca	Director, Centre for the Study of Learning and Performance, Concordia U.
Ms. Rhonda Amsel	McGill University, Dept. of Psychology, 1205 Dr. Penfield, Montreal, QC, H3A 1B1	inp4@musicb.mcgill.ca	Associate Dean, Student Services, and Consulting Statistician, McGill U.
Mr. Jennison Asuncion	7400 Sherbrooke St. W., #304, Montreal, QC, H4B 1R8	j_asunc@alcor.concordia.ca	Acting VP- NEADS (National Educational Ass'n of Disabled Students), Concordia U student
Dr. Sally Bailes	SMBD-Jewish General Hospital, 4333 Cote. St. Catherine Rd., Montreal, QC, H3T 1E4	sbailes@autoroute.net	Consultant to the Montreal Ass'n for the Blind
Ms. Maria Barile	7785 Louis-Hebert, Montreal, QC, H2E 2Y1	mdb2@musica.mcgill.ca	Dawson - research team
Ms. Trena Barnes	170 Kraft Ave. #3 Kitchener ON N2A 2J4	N/A	Former VP - AQEHPS, Dawson College student - graduated '98
Mr. Leo Bissonnette	Concordia University, 1455 de Maisonneuve W., Montreal QC H3G 1M8	bissonn@vax2.concordia.ca	Coordinator - Services for Students with Disabilities
Ms. Diana Brent	1414 Hunterbrook Rd. NW, Calgary, Alberta, T2K 4V5	dbrent@canuck.com	Council of Canadians with Disabilities (CCD)
M. Serge Brassard	AQEHPS, H.E.C., Université de Montréal, 5255 Ave. Decelles #4041, Montreal, QC H3T 1V6	aqehps@cedep.net	Director - (AQEHPS) l'Association québécoise des étudiants handicapés au postsecondaire
M. Mario Boulet	4580 St. Zotique #20, Montreal, QC H1T 1M4	N/A	Director - (AQEHPS) l'Ass'n québécoise des étudiants handicapés au postsecondaire - student: Cegep de Rosemont
Dr. Alain Breuleux	Faculty of Education, 3700 McTavish St. Montreal, Qc., H3A 1Y2	ed13@musica.mcgill.ca	Director - Office of Learning and Information Technologies, McGill U.
Ms. Michelle Clabrough	Dawson College 3040 Sherbrooke St. W., Montreal, QC, H3Z 1A4	mclabrough@dawsoncollege.qc.ca	Dean of Students, Dawson College
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Ms. Lee Covington	2780 Rowatt #2 Ottawa, ON K2B 6P1	grossner@nortel.ca	Psychologist and Oral Interpreter
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M. Daniel Fiset	Service d'Aide à l'Intégration Des Éléves, Cegep Vieux Montréal, 255 Ontario E., Montreal, H2X 1X6	N/A	Director of (SAIDE) Service d'aide à l'intégration des élèves - Cegep du Vieux Montréal
Mr. David Fourney	109-126 Edinburgh Place, Saskatoon, Saskatchewan, S7H 5J7	dfourney@the.link.ca	NEADS (National Educational Ass'n of Disabled Students) Board Member - U. of Sask. Student
Mr. Dave Gaucher	90 Prince Arthur St. W. #36, Montreal, QC, H2X 1S6	mary.piccolo@cgi.ca	Revenue Canada
Mr. Christian Généreux	4540 rue Rivard #1, Montreal, Qc., H2J 2N3	genereux@cedep.net	President - AQEHPS, UQAM student
Dr. Lindsay Gething	University of Sydney, Sydney, NSW006, Australia	lgething@uranus.nursing.su.edu.au	Disability researcher, U. of Sydney
M. Luc Guertin	303, René-Lévesque Blvd. # 226-B, Mtl. PQ H2X	lucguertin@yahoo.com	Director - (AQEHPS) l'Ass'n québécoise des
Mr. Jean-Pierre Guimont	Dawson College, 3040 Sherbrooke St. W., Montreal, QC, H3Z 1A4	jpguimont@dawsoncollege.qc.ca	Head, Audio/Visual Production, Dawson College

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ADVISORY BOARD (continued)			
Dr. Alice Havel	Dawson College, 3040 Sherbrooke St. W., Montreal, QC, H3Z 1A4	ahavel@dawsoncollege.qc.ca	Coordinator - Services for Dis. Students, Dawso College
Ms. Darlene Judd	Montreal Ass'n for the Blind, 7000 Sherbrooke St. W., Montreal, QC, H4B 1R3	MDVT@MUSICA.MCGILL.CA	Montreal Association for the Blind
M. Jean-Charles Juhel	Cégep de Sainte-Foy, 2410, Chemin Sainte-Foy, Sainte-Foy (Québec), G1V 1T3	jcjuhel@cegep-ste-foy.qc.ca	Director of Le Services aux étudiants handicapé Cégep de Sainte-Foy
Ms. Deborah Kennard	8885 Esplanade # 203, Montreal, QC, H2N 1V3	dkennard@total.net	Student - McGill U.
Mr. Andre Leblanc	Champlain College, 900 Riverside Drive, St. Lambert, QC, J4P 3P2	N/A	Director of student services, Champlain College
Mr. Jason Lavers	73 Stafford Rd., Baie D'Urfe, QC, H9X 2Y9	mclv@musica.mcgill.ca	Instructor - Montreal Ass'n for the Blind, Preside Dream Scape Computers
Mme Lucie Lemieux-Brassard	2218 rue Nicolet, Montréal, QC H1W 3L2	mouffe@dsuper.net	Vice President - AQEHPS
Dr. Eva Libman	SMBD-Jewish General Hospital, 4333 Cote. St. Catherine Rd., Montreal, QC, H3T 1E4	mc65@musica.mcgill.ca	Director, Sleep & Aging Project, JGH and Conc U.
Ms. Heidi Macdonald	411 Queen's St.#2, Charlottetown, P.E.I., C1A 4E5		student - University of Prince Edward Island
Ms. Karen McCall	563 Wolsey Cres., Oakville, ON, L6L 4W3	martha@globalserve	Access Technology Specialist, ATRC, OISE, Uo
Ms. Cheryl McNab	1701 6th St N., Cornerbrook, NFLD., V1C 3M7	N/A	Student - College of the Rockies
Mr. Chris Mercer	College of the North Atlantic, Bay St. George	cbmercer@northatlantic.nf.ca	Guidance Counselor, College of the North Atlant
Mr. Bruce Mesman	4355 Mathissi Place, Burnaby, BC, V5G 4S8	bruceme@ola.bc.ca	Open Learning Agency Service Provider + NEAI Board Member - BC
Ms. Roseann Millin	4488 Ste. Catherine St. W. #801. Montreal, QC, H3Z 1R7	N/A	Counsellor, Dawson College
Ms. Janet Mee	University of British Columbia, 1874 East Mall, Vancouver, BC, V6T 2Z2	mee@unixg.ubc.ca	Member of H.E.A.R.D. Network
Mr. Bryan Oulton	Neil Squire Foundation, Suite 220-2250 Boundary Road, Burnaby, BC, V5M 4G5	bryan@neilsquire.ca	BC Regional Mgr., Neil Squire Foundation
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Mr. Charles Petit	VisuAide Inc., 841 Boul. Jean Paul Vincent, Longueuil, QC, J4G 1R3	petic@visuaid.com	Director of R & D, Visuaide, VP CanADIAS
Ms. Fay Schipper	Mackay Center, 3500 Decarie. Montreal, QC, H4A 3J5	fay@total.net	Counsellor & Volunteers Coordinator, Mackay C
Mme Joanne N. Senécal	Service d'Aide à l'Intégration Des Élèves, Cegep Vieux Montréal, 255 Ontario E., Montreal, H2X 1X6	N/A	Consultant to (SAIDE) Service d'aide à l'intégra des élèves - Cegep du Vieux Montréal
Dr. Linda Shohet	Dawson College. 3040 Sherbrooke St. W. Montreal, QC, H3Z 1A4	lshohet@dawsoncollege.qc.ca	Director, Center for Literacy
Ms. Angela Stevens	310 Fetter Ave., Hamilton, New Jersey, USA, 08610	motahari@hicom.net	Visual Impairment and technology expert
Ms. Vicki Tagalakis	5505 Snowdon #59, Montreal, QC, H3X 1Y7	vtagsoc@mch.mcgill.ca	CLSC NDG/Montreal West
Ms Ruth Walsh	Memorial University of Newfoundland, St. John's, NFL, A1C 5S7	rwalsh@morgan.ucs.mun.ca	Member of H.E.A.R.D. Network
Mr. Stephen I. Weiss	2709 Lovett Road, Coldbrook, NS, B4R 1A5	nehpets@siw.org	Student - Acadia University, NS
Ms. Joan Wolforth	McGill University, 845 Sherbrooke St. W., Montreal, QC, H3A 2T5	Joanw@stuserv.lan.mcgill.ca	Director - Services for Students with Disabilities, President CADSSPE

22 of these Advisory Board members have a disability

Appendix 3

Phase I: Focus Group Agendas

Students, Personnel Responsible For Providing Services To Students With Disabilities, Professors, "Ragtag"

English & French

foc1age.doc nov21, 1997

Agenda: Focus Group #1

Learning Technologies and Students with Disabilities in Post-Secondary Education

Dawson College
3040 Sherbrooke St., West
Westmount, Quebec, H3Z 1A4

November 21st, 1997
Room # 5E21, 3:00 - 5:00 pm

1. Welcome

2. Introductions

3. Purpose of Meeting

4. Round Table on Computer, Information and Adaptive Technologies.

    Q.1. What advantages and disadvantages do you see that computer, information and adaptive technologies have for students with disabilities?

    Q.2. a) What personal experiences have you had, if any, in the use of these technologies?
    b) What factors do you feel prevent or help access to these technologies?

5. Varia

6. Adjournment

Agenda: Groupe de Focus #1

Les Technologies d'Apprentissage et les Étudiants Handicapés de Niveau Post-Secondaire

Collège Dawson
3040, rue Sherbrooke Ouest
Westmount, Québec, H3Z 1A4

Vendredi, le 21 novembre, 1997
Salle # 5E21, 15h00 – 17h00

1. Mots de Bienvenue

2. Présentations

3. Objectifs de la Rencontre

4. Table Ronde Concernant les Technologies d'Apprentissage, Informatiques et Adaptatives.

   Q.1. Quels sont, selon vous, les avantages et les désavantages des technologies d'apprentissage et des technologies informatiques et adaptatives pour les étudiants ayant des handicaps?

   Q.2. a) Quelles expériences personnelles avez-vous, si expérience il y a, avec l'usage de ces technologies?
   b) Quels facteurs, selon vous, aident ou à l'inverse nuisent à l'utilisation de ces technologies?

5. Varia

6. Levée de Réunion

foc2age.doc nov25, 1997

Agenda of the Focus Group #2

Learning Technologies and Students with Disabilities in Post-Secondary Education

Dawson College
3040 Sherbrooke St., West
Westmount, Quebec, H3Z 1A4

November 25, 1997
Room # 7C5, 3:00 - 5:00 pm

1. Welcome

2. Introductions

3. Purpose of Meeting

4. Round Table on Computer, Information and Adaptive Technologies.

   Q.1. What are funding sources for adaptive,computer and information technologies?

   Q.2. a) If the college or university owns adaptive computer technologies, how do service providers learn how to use it, and who provides the technological supports and training?
   b) How do students learn how to use adaptive computer technologies?

   Q.3. Comment on the role of other departments such as audio-visual and the library, in providing adaptive computer services?

   Q.4. How are decisions made in your institution about what adaptive computer technologies students use?

   Q.5. Technology is always changing. How do you obtain the most current information on those changes?

5. Varia

6. Adjournment

Agenda du Groupe de Focus #2

Les Technologies d'Apprentissage et les Étudiants Handicapés de Niveau Post-Secondaire

Collège Dawson
3040, rue Sherbrooke Ouest
Westmount, Québec, H3Z 1A4

Mardi, le 25 novembre, 1997
Salle # 7C5, 15h00 – 17h00

1. **Mots de Bienvenue**

2. **Présentations**

3. **Objectifs de la Rencontre**

4. **Table Ronde Concernant les Technologies d'Apprentissage Informatiques et Adaptatives**

    Q.1. D'où proviennent les fonds pour les technologies d'apprentissage adaptatives?

    Q.2. a) Si l'université ou le Cégep a des technologies informatiques adaptatives, comment est-ce que les répondants locaux apprennent à les utiliser, et qui en assure le soutien technique et l'entraînement?
    b) Comment est-ce que les étudiants apprennent à utiliser les technologies informatiques adaptatives?

    Q.3. Commentez sur le rôle d'autres départements tels que l'audio-visuel et la bibliothèque, dans la fourniture de services informatiques adaptatifs?

    Q.4. Comment est-ce que les décisions sont prises dans votre institution concernant le type de technologies informatiques adaptatives utilisé par les étudiants?

    Q.5. La technologie est constamment en train de changer. Comment obtenez-vous les dernières informations relatifs à ces changements?

5. **Varia**

6. **Levée de Réunion**

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Agenda of the Focus Group #3

Learning Technologies and Students with Disabilities in Post-Secondary Education

Dawson College
3040 Sherbrooke St., West
Westmount, Quebec, H3Z 1A4

November 28, 1997
Room # 5E21, 3:00 - 5:00 pm

1. **Welcome**
2. **Introductions**
3. **Purpose of Meeting**
4. **Round Table on Computer, Information and Adaptive Technologies.**

   Q.1. What are new developments in computer, information and adaptive technologies in your area that are/ should be/ or could be useful to people with different disabilities?

   Q.2. What new developments in computer, information and adaptive technologies do you see as likely to pose difficulties for people with disabilities?

   Q.3. What other resources could our research team call upon for relevant information?

   Q.4. What prompted your interest in our research?

5. **Varia**
6. **Adjournment**

Agenda du Groupe de Focus #3

Les Technologies d'Apprentissage et les Étudiants Handicapés de Niveau Post-Secondaire

Collège Dawson
3040, rue Sherbrooke Ouest
Westmount, Québec, H3Z 1A4

Mardi, le 28 novembre, 1997
Salle # 5E21, 15h00 – 17h00

1. **Mots de Bienvenue**
2. **Présentations**
3. **Objectifs de la Rencontre**
4. **Table Ronde Concernant les Technologies d'Apprentissage Informatiques et Adaptatives**

    Q.1. Quels sont, dans vos domaines respectifs de spécialisation, des développements nouveaux dans les technologies d'apprentissage, et les technologies informatiques et adaptatives qui sont/ devraient être/ ou pourraient être utiles pour des personnes ayant divers types de handicaps?

    Q.2. À l'inverse, quels nouveaux développements dans les technologies d'apprentissage, et les technologies informatiques et adaptatives sont susceptibles de poser des difficultés aux personnes handicapés?

    Q.3. De quelle(s) autre(s) ressource(s) notre équipe de recherche pourrait –elle obtenir des informations pertinentes?

    Q.4. Qu'est-ce qui a suscité votre intérêt dans ce projet de recherche?

5. **Varia**
6. **Levée de Réunion**

foc4age.doc December 23, 1997

Agenda of the Focus Group #4

Learning Technologies and Students with Disabilities in Post-Secondary Education

Dawson College
3040 Sherbrooke St., West
Westmount, Quebec, H3Z 1A4

January 16, 1998
Room # 7C5, 3:00 - 5:00 p.m.

1. **Welcome**

2. **Introductions**

3. **Purpose of Meeting**

4. **Round Table on Computer, Information and Adaptive Technologies.**

   Q.1. a) What personal experiences have you had, if any, in the use of computer, information and adaptive technologies with students with disabilities in your courses?
   b) What factors do you feel prevent or help access to these technologies?

   Q.2. What advantages and disadvantages do you see that computer, information and adaptive technologies have for students with disabilities?

   Q.3. a) What are new developments in computer, information and adaptive technologies in your discipline that are/ should be/ or could be useful to students with different disabilities?
   b) What potential benefits or limitations do you foresee with these computer, information, and adaptive technologies for students with disabilities?

   Q.4 What computer, information and adaptive technology services could the institution offer you to make teaching students with disabilities more effective?

5. **Varia**

6. **Adjournment**

Agenda du Groupe de Focus #4

Les Technologies d'Apprentissage et les Étudiants Handicapés de Niveau Post-Secondaire

Collège Dawson
3040, rue Sherbrooke Ouest
Westmount, Québec, H3Z 1A4
Le 16 janvier, 1998
Salle # 7C5, 15h00 – 17h00

1. **Mots de Bienvenue**

2. **Présentations**

3. **Objectifs de la Rencontre**

4. **Table Ronde Concernant les Technologies d'Apprentissage Informatiques et Adaptatives**

    Q.1. a) Quelles expériences personnelles avez-vous eu, si expérience il y a, dans l'utilisation des technologies d'apprentissage informatiques et adaptatives, avec des étudiants handicapés, dans le cadre de votre cours?
    b) Selon vous, quels facteurs aident ou préviennent l'accès à ces technologies?

    Q.2. Quels sont, selon vous, les avantages et les désavantages des technologies d'apprentissage informatiques et adaptatives pour les étudiants ayant des handicaps?

    Q.3. a) Quels sont des développements nouveaux dans le domaine des technologies d'apprentissage informatiques et adaptatives qui sont/ devraient être/ ou pourraient être utiles pour les étudiants handicapés?
    b) Quels bénéfices ou limites potentielles envisagez-vous avec ces technologies d'apprentissage informatiques et adaptatives pour les étudiants handicapés?

    Q.4. Quels types de services techniques est-ce que votre institution pourrait offrir pour vous aider à enseigner aux étudiants handicapés de manière plus efficace?

5. **Varia**

6. **Levée de Réunion**

Appendix 4

Phase II: Interview Questions
Students
English & French

ph2stuqe.doc Dec 7, 1998

STUDENT INTERVIEW QUESTIONS

Catherine S. Fichten, Jennison Asuncion, Darlene Judd, Iris Alapin, Maria Barile
Adaptech Project
Dawson College
Montréal, Québec, Canada
1998

My name is ____________________ . I am part of a team of researchers from Dawson College in Montreal. We are conducting a Canada wide investigation on computer, information and adaptive technologies and college and university students with disabilities. The goals of our study are to assess the use of these technologies by students with various disabilities as well as to determine what their main needs and concerns are. We plan to use the results to make recommendations to decision makers.

All the information you provide will remain confidential and your privacy will be completely protected.

Do you have time right now to answer some questions? It will take about 30 minutes. Before I go any further I should ask, is it OK for you to answer these questions on the telephone or would you prefer to do the interview another way? Would you mind if I audiotape our conversation?

---

0. RESEARCH CODES

a. Participant number

b. Today's date

1. CONTACT INFORMATION

a. Respondent's name

b. Telephone number and address

c. E-mail address

2. DEMOGRAPHICS

a. Gender

b. Age

3. EDUCATIONAL INSTITUTION

a. What is the name of your postsecondary educational institution?

b. Where is it located? (city, province)

c. What kind of educational institution is it?

4. QUALIFICATIONS

a. What type of qualifications are you pursuing?

b. Are you a full time or part time student?

c. Are you considered a day or night student?

5. FIELD OF STUDY

What is your field of study?

6. IMPACT OF IMPAIRMENT/DISABILITY

Does your disability affect your activities or performance at school / as a student?

7. NATURE OF IMPAIRMENT/DISABILITY

We are interested in the use of computer technologies by students with disabilities and need to better understand the nature of your impairment. This is so that we can attempt to link the impairments students have with the computer technologies they use.

a. What is your impairment or disability?

b. How long have you had your impairment/disability? Please specify: most of my life, recent, or somewhere in between.

c. For the purposes of this study I need to classify your disability. Here are the categories:

1. Are you blind or visually impaired/partially sighted?
2. Are you Deaf or hard of hearing?
3. Do you have a speech impairment?
4. Do you have a learning disability?
5. Do you use a wheelchair or have difficulty walking ?
6. Do you have a medical condition that causes an impairment?
7. Do you have difficulty using your arms or hands?

d. What assistive aids other than computer technologies do you use?

8. COMPUTER TECHNOLOGY IN GENERAL

a. Overall, how often do you use computer technologies on a scale of 0 to 10, with 0 being "I never or hardly ever use computer technologies" to 10 being "I use computer technologies very often"

b. Rate your overall level of expertise in using computer technologies on a scale of 0 to 10, with 0 being "I am very bad with computer technologies" to 10 being "I am very good with computer technologies"

c. Overall how comfortable are you with computer technologies on a scale from 0 to 10, with 0 being "I am very uncomfortable with computer technologies" to 10 being " I am very comfortable with computer technologies"

9. DIFFICULTY USING

Do you have physical difficulty (if not using, "Would you have difficulty"):

a. using a computer keyboard?

b. using a monitor?

c. using a mouse?

d. using a printer?

e. handling diskettes?

10. CURRENTLY USING

a1. What computer technologies are you currently using? Who makes it / what kind?

a2. Can you tell me why you don't use computer technologies?

b. Where do you primarily use these computer technologies?

c. What do you use each of these computer technologies for?

11. ADVANTAGES & DISADVANTAGES

a. (for users only) What are the advantages and disadvantages of using computer technologies, for you?

b. (for nonusers only) What do you think the advantages and disadvantages of using computer technologies might be for you?

12. HOW OBTAINED

(for users only)

a. Who paid for your computer technologies?

b. Who owns your computer technologies

c. Are there any problems associated with who owns or who paid for your computer technologies and if so, do you have any solutions to these problems?

13. LEARN TO USE

(for users only)

a. How did you learn to use your computer technologies?

b. Did this method of learning work well for you and if not, what method might have worked better?

14 HELP

a. What do you do when you need assistance with your computer technologies? (at home, at school, in the library)?

b. Does this method of assistance work well for you and if not, what could be done to make getting help easier for you?

15. NEW COMPUTER TECHNOLOGIES

How do you find out about new computer technologies that could be helpful to you?

16. WISH LIST

a. What is your computer technology "wish list" - what would you like to see improved, changed, modified, developed, and so on?

b. What prevents you from obtaining your computer technology "wish list" and what could be done to get you some of these items?

17. OTHER ISSUES

a. What is the biggest waste of time you have experienced or are currently experiencing with regard to the use of your computer technologies?

b. What other computer technology issues are important to you that I have not asked you about?

We have completed the interview. Thank you for your help.

ph2stuqf.doc 7 décembre, 1998

QUESTIONNAIRE POUR LES ÉTUDIANT(E)S

Catherine S. Fichten, Jennison Asuncion, Darlene Judd, Iris Alapin, Maria Barile
Projet Adaptech
Collège Dawson
Montréal, Québec, Canada
1998

Je m'appelle ________. Je fais partie d'une équipe de chercheur(e)s du Collège Dawson à Montréal menée par Dr. Catherine Fichten avec la collaboration de NEADS (l'Association nationale des étudiant(e)s handicapé(e)s au niveau post-secondaire) Nous faisons une enquête à travers le Canada sur les technologies d'apprentissage informatiques adaptées et les étudiant(e)s ayant des incapacités de niveaux collégial et universitaire. Les buts de cette étude sont d'évaluer l'utilisation de ces technologies par les étudiant(e)s ayant divers types d'incapacités et de déterminer ce que sont leurs besoins et leurs préoccupations. Nous avons l'intention d'utiliser ces résultats pour faire des recommandations auprès des autorités.

Soyez assurés que toute l'information que vous fournirez demeurera confidentielle et que votre vie privée sera entièrement protégée.

Auriez-vous un moment pour répondre à quelques questions? Ça prendra à peu près 30 minutes. Est-ce que ça vous convient de répondre à mes questions au téléphone ou préféreriez-vous que l'on fasse l'entrevue d'une autre manière? Est-ce que ça vous dérange si j'enregistre notre entretien?

---

0. CODES DE RECHERCHE

a. Numéro du (de la) répondant(e)

b. Date d'aujourd'hui

1. INFORMATION SUR LE CONTACT

a. Nom du (de la) répondant(e)

b. Adresse et numéro de téléphone

c. Adresse électronique

2. DONNÉES DÉMOGRAPHIQUES

a. Genre

b. Âge

3. ÉTABLISSEMENT ÉDUCATIONNEL

a. Quel est le nom de l'établissement post-secondaire que vous fréquentez?

b. Où est-elle située? (Ville, Province)

c. Quel type d'établissement fréquentez-vous?

4. QUALIFICATIONS

a. Quel type de diplôme recherchez-vous?

b. Êtes-vous étudiant(e) à temps plein ou à temps partiel?

c. Êtes-vous considérez un(e) étudiant(e) de jour ou de soir?

5. DOMAINE D'ÉTUDE

Quel est votre domaine d'étude?

6. IMPACT DES LIMITATIONS FONCTIONNELLES ET DES INCAPACITÉS

Est-ce que vos incapacités vous limitent dans l'accomplissement de vos activités ou dans votre performance à l'école?

7. NATURE DES LIMITATIONS FONCTIONNELLES ET DES INCAPACITÉS

Nous nous intéressons à l'utilisation des technologies informatiques par les étudiant(e)s handicapé(e)s et nous avons besoin de mieux connaître la nature de vos incapacités afin de faire des liens entre les types d'incapacités qu'ont les étudiant(e)s et les technologies informatiques qu'ils utilisent.

a. Quelles est la nature de vos incapacités?

b. Depuis combien de temps avez-vous votre handicap/incapacité? Veuillez spécifier: la majorité de ma vie, récemment, ou entre les deux.

c. Pour les fins de cette étude, j'ai besoin de classer votre handicap. Voici les différentes catégories:

1. Avez-vous une déficience visuelle ?
2. Êtes-vous sourd(e) ou avez-vous une autre déficience auditive?
3. Avez-vous une limitation à la communication orale ?
4. Avez-vous des troubles d'apprentissage?
5. Utilisez-vous un fauteuil roulant ou avez-vous des limitations à la marche?
6. Est-ce que vos incapacités résultaient d'un problème actuel de santé ou d'une maladie récente?
7. Avez-vous des difficultés avec l'usage de vos bras ou de vos bras?

d. Mises à part les technologies d'apprentissage, quelles aides techniques utilisez-vous?

8. TECHNOLOGIES INFORMATIQUES EN GÉNÉRALE

a. En général, à quelle fréquence utilisez-vous des technologies informatiques, sur une échelle allant de 0 à 10, avec 0 correspondant à "Je n'utilise jamais ou presque jamais de technologies informatiques" et 10 "j'utilise très souvent des technologies informatiques"?

b. Évaluez votre niveau général d'expertise dans l'utilisation des technologies informatiques sur une échelle allant de 0 "Je suis très mauvais(e) dans le domaines des technologies informatiques" à 10 "Je suis très fort(e) dans le domaine des technologies informatiques".

c. Quel est votre niveau général d'aise avec les technologies informatiques sur une échelle allant de 0 à 10, avec 0 correspondant à " Je suis très mal à l'aise avec les technologies informatiques" et 10 "Je suis très à l'aise avec les technologies informatiques"?

9. DIFFICULTÉS À L'USAGE

Avez-vous des difficultés physiques avec ("Si vous utilisiez des technologies informatiques, est-ce que vous auriez des difficultés physiques avec) :

a. l'utilisation d'un clavier d'ordinateur?

b. l'utilisation d'un écran?

c l'utilisation d'une souris?

d. l'utilisation d'une imprimante?

e. la manipulation de disquettes?

10. UTILISATEURS / UTILISATRICES ACTUEL(LES)

a1. Quelles technologies informatiques utilisez-vous présentement?

a2. Est-ce que vous pouvez me dire pour quelle(s) raison(s) vous n'utilisez pas de technologies informatiques?

b. Où utilisez-vous principalement ces technologies informatiques?

c. À quoi vous sert chacune des technologies suivantes?

11. AVANTAGES & DÉSAVANTAGES

a. (Utilisateurs/utilisatrices) Quelles sont, pour vous, les avantages et les désavantages d'utiliser des technologies informatiques?

b. (Non-utilisateurs / non-utilisatrices) Quels pourraient-être, pour vous, les avantages et les désavantages d'utiliser des technologies informatiques?

12. COMMENT OBTENU

(Utilisateurs/utilisatrices)

a. Qui a payé vos technologies informatiques?

b. À qui appartiennent vos technologies informatiques?

c. Y a-t-il des problèmes associés avec la personne/l'organisme à qui appartiennent ou qui a payé les technologies informatiques. Si oui, avez-vous des solutions face à ces problèmes?

13. APPRENTISSAGE DES TECHNOLOGIES

(Utilisateurs/utilisatrices)

a. Comment avez-vous appris à utiliser vos technologies informatiques?

b. Est-ce que cette méthode d'apprentissage a bien marché pour vous et sinon, quelle méthode aurait été meilleure?

14. AIDE

a. Que faites-vous quand vous avez besoin d'aide avec vos technologies informatiques? (à la maison, à l'école, à la bibliothèque)

b. Est-ce que ce type d'assistance fonctionne bien pour vous, et sinon, qu'est-ce qui pourrait être fait pour obtenir de l'aide plus facilement?

15. NOUVELLES TECHNOLOGIES INFORMATIQUES

Comment apprenez-vous que de nouvelles technologies informatiques pourraient vous être utiles?

16. LISTE DE SOUHAITS

a. Avez-vous une liste de souhaits en ce qui concerne les technologies informatiques – qu'est-ce que vous aimeriez voir amélioré, changé, modifié, développé (...)?

b. Qu'est-ce qui vous empêche d'obtenir les technologies informatiques que vous désirez et qu'est-ce qui pourrait être fait pour que vous obteniez certaines de ces technologies?

17. AUTRES SUJETS

a. Quelle a été la plus grande perte de temps que vous ayez vécus ou que vous vivez en ce moment relativement à l'usage de vos technologies informatiques?

b. Y a-t-il d'autres sujets qui sont pertinents pour vous par rapport aux technologies informatiques et que je n'ai pas soulevés? Si oui, lesquels?

Nous avons complété l'entrevue. Merci de votre aide.

Appendix 5

Phase II: Consent Form

DAWSON
COLLEGE

3040 Sherbrooke St. West
Montreal, QC, Canada
H3Z 1A4

(514) 931-8731

Spring, 1998

Informed Consent

1. The purpose of this Canada-wide grant funded investigation is to evaluate the use and the utility of computer technologies in the postsecondary education of students with disabilities.

2. I understand that I am asked to participate in a telephone interview to be scheduled at a time convenient to me. This interview will be concerned with computer, information and adaptive technologies in the postsecondary context. I understand that all information I provide will be kept strictly confidential and will not be used for any purposes other than this study.

3. I will be asked to allow the telephone interview to be tape recorded. The tapes will only be used to ensure that the most accurate information is transcribed by the interviewer. The tapes will be erased once the study is completed. I may request that my interview not be audiotaped. If I agree to be tape recorded, I may at any time request that the taping stop if I so desire.

4. I understand that I am free to ask any questions concerning the methodology of this study at any time. If for any reason I experience any discomfort or concern during my participation in this project, I understand I am free to discuss this with the project's directors, Dr. Catherine Fichten (514-931-8731 ext. 1546; e-mail: md71@musica.mcgill.ca) and Ms. Maria Barile (514-931-8731 ext. 1533; e-mail: mdb2@musica.mcgill.ca). I acknowledge that I am free to participate or not, and that I have the option of terminating my participation in this study at any time.

5. I understand that if results of this study are published, any information I provide will remain strictly confidential, and that my privacy will be completely protected. I understand that any statements I make will never be linked to either myself or to my institution.

6. I understand that by responding to the interview questions I agree to have the data I provide included in the study on the use and the utility of computer technologies in the post-secondary education of students with disabilities.

Appendix 6

Phase II: Interview Questions

College And University Personnel Responsible For Providing Services To Students With Disabilities

English & French

ph2serqe.doc December 7, 1998

SERVICE PROVIDER INTERVIEW QUESTIONS

Catherine S. Fichten, Jennison Asuncion, Darlene Judd, Maria Barile, Iris Alapin
Adaptech Project
Dawson College
Montréal, Québec, Canada
1998

My name is ____________________. I am part of a team of researchers from Dawson College in Montreal. We are conducting a Canada wide grant funded investigation on computer, information and adaptive technologies and their use by college and university students with disabilities. We are collaborating with the National Educational Association Of Disabled Students (NEADS) in this research. The goals of our study are to assess the use of these technologies by students with various disabilities as well as to determine what their main needs and concerns are.

We plan to use the results to make recommendations to decision makers. We are interested both in the perspectives of the students themselves, and the professionals who deliver specialized services at post-secondary institutions. This of course is why we are contacting you.

Who would be the best person to speak to - someone who oversees services for students with disabilities for the whole institution, not just one campus or disability group? We are attempting to get a global perspective of your institution.

All the information you provide will remain confidential, and your privacy will be completely protected. Any statements you make will never be linked to either yourself or your institution.

ONCE A PERSON IS CHOSEN

I would like to schedule a time with you to ask you a series of questions. It will take about 40 minutes.

AT TIME OF INTERVIEW ASK

Before I go any further I should ask, is it OK for you to answer these questions on the telephone or would you prefer to do the interview another way?

Would you mind if I audiotape our conversation?

---

0. RESEARCH CODES

a. Participant number

b. Today's date

1. CONTACT INFORMATION

a. Respondent's name

b. Telephone number and address

c. E-mail address

d. What is your job title in terms of providing services to students with disabilities at your institution?

2. DEMOGRAPHICS

Gender

3. EDUCATIONAL INSTITUTION

a. What is the name of your post-secondary educational institution?

b. What kind of educational institution is it?

4. STATISTICS ON STUDENTS WITH DISABILITIES

I would like to know how many students with disabilities attended your educational institution - all types of disabilities - within the last academic year.

5. COMPUTERS & SPECIFIC DISABILITIES

For the purposes of this study, we would like to know whether you have had students with the following disabilities at your institution.

a. students who are totally blind

b. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

c. students who are visually impaired/partially sighted

d. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

e. students who are Deaf

f. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

g. students who are hard of hearing

h. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

i. students who have learning disabilities

j. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

k. students who use a wheelchair or who have trouble walking

l. Does your institution have any specialized computer technologies for them? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

m. students who have difficulty using their hands

n. Does your institution make available any specialized computer technologies for these students? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?

o. students with other disabilities

p. Does your institution make available any specialized computer technologies for these students? Create a listing of the computer technologies. If necessary: "Who makes it / what kind?"

6. INTERNET ACCESS

a. Does your institution provide Internet access for students?

b. Are there adaptive computers with Internet access?

7. CENTRALIZATION

Is your specialized computer technology for students with disabilities centralized in one location or is it spread out among buildings and campuses?

8. HOW OBTAINED

a. Who pays for the specialized computer technologies for students with disabilities at your institution?

b. Are there any problems associated with how funding is obtained for specialized computer technologies for students with disabilities at your institution and if so, do you have any solutions to these problems?

9. PURCHASING SPECIALIZED COMPUTER TECHNOLOGIES - DECISION MAKING PROCESS

How are decisions made in your institution about what specialized computer technologies will be purchased for students with disabilities?

10. HOURS OF ACCESS

In general, can students with disabilities access the specialized computer technologies at your institution:

a. during business hours

b. during lunch

c. in the evenings when institution is open

d. on weekends when institution is open

11. LOANING TECHNOLOGIES

a. Does your institution loan computers to students with disabilities?

b. Tell me how your program works.

12. ADVANTAGES & DISADVANTAGES

What are the advantages and disadvantages of using computer technologies for students with disabilities?

13. NON-USERS

a. Are there students with disabilities at your institution who could benefit from using computer technologies, but are not using them?

b. What do you think are some of the reasons students do not use computer technologies - what reasons have students given for not using the technology?

14. STAFF - LEARN TO USE

a. How do staff who oversee the specialized computer technology for students with disabilities learn to use this equipment?

b. Does this method of learning work well for your staff and if not, what method might work better?

15. STUDENTS - LEARN TO USE

a. How do students with disabilities learn to use computer technologies at your institution?

b. Does this method of learning work well for students with disabilities and if not, what method might work better?

16. NEW COMPUTER TECHNOLOGIES

How do you find out about new computer technologies that could be useful to students with disabilities?

17. WISH LIST

a. What is your computer technology "wish list" for students with disabilities (in your DSS office / specialized lab, in the library, elsewhere in the institution) - what would you like to see improved, changed, modified, developed, and so on?

b. What prevents you from obtaining your computer technology "wish list" and what could be done to get you some of these items?

18. OTHER ISSUES

a. In terms of computer accessibility for students with disabilities, what do you feel are the most successful and least successful aspects of your institution?

b. What other computer technology issues are important to you that I have not asked you about?

We have completed the interview. Thank you for your help.

ph2serqf.doc 7 décembre, 1998

QUESTIONS D'ENTREVUE POUR LES RÉPONDANT(E)S LOCAUX(LES)

Catherine S. Fichten, Jennison Asunción, Darlene Judd, Maria Barile, Iris Alapin
Projet Adaptech
Collège Dawson
Montréal, Québec, Canada
1998

Je m'appelle ________. Je fais partie d'une équipe de chercheur(e)s du Collège Dawson à Montréal. Nous menons une enquête subventionnée à travers le Canada sur les technologies d'apprentissage informatiques adaptées et leur utilisation par les étudiant(e)s ayant des incapacités de niveaux collégial et universitaire. Cette étude se fait avec la collaboration de NEADS (l'Association nationale des étudiant(e)s handicapé(e)s de niveau post-secondaire). Les buts de cette étude sont d'évaluer l'utilisation de ces technologies par les étudiant(e)s ayant divers types d'incapacités et de déterminer ce que sont leurs besoins et leurs préoccupations.

Nous avons l'intention d'utiliser ces résultats pour faire des recommandations auprès des autorités. Nous nous intéressons aux perspectives respectives des étudiant(e)s eux-mêmes et celles des professionnel(le)s qui fournissent les services spécialisés dans les institutions post-secondaires. Ceci évidemment est la raison pour laquelle je vous contacte.

Quelle serait la meilleure personne à qui parler-de préférence la personne responsable des services offerts aux étudiant(e)s handicapé(e)s pour l'institution entière, et non pour un seul campus ou un seul sous-groupe de personnes handicapées? Nous tentons d'obtenir un portrait global de votre institution.

Soyez assurés que toute l'information que vous fournirez demeurera confidentielle et que votre vie privée sera entièrement protégée. Notez également qu'aucune affirmation que vous pourrez faire ne sera associée à vous personnellement ou encore à votre établissement.

UNE FOIS LA PERSONNE CHOISIE

J'aimerais fixer un rendez-vous avec vous pour vous posez une série de questions. L'entrevue durera à peu près 40 minutes.

AU MOMENT DE L'ENTREVUE, DEMANDEZ

Avant de commencer je devrais vous demander si ça vous convient de répondre à mes questions au téléphone ou préféreriez-vous que l'on fasse l'entrevue d'une autre manière?

Est-ce que ça vous dérange si j'enregistre notre entretien?

---

0. CODES DE RECHERCHE

a. Numéro du (de la) répondant(e)

b. Date d'aujourd'hui

1. INFORMATION SUR LE CONTACT

a. Nom du (de la) répondant(e)

b. Numéro de téléphone et adresse

c. Adresse électronique

d. Quel est le titre de votre position en terme des services que vous rendez aux personnes ayant des incapacités au sein de votre établissement?

2. DONNÉES DÉMOGRAPHIQUES

Genre

3. ÉTABLISSEMENT ÉDUCATIONNEL

a. Quel est le nom de votre établissement post-secondaire?

b. Quel type d'établissement est-ce que c'est?

4. STATISTIQUES SUR LES ÉTUDIANT(E)S AYANT DES INCAPACITÉS

J'aimerais savoir combien d'étudiant(e)s ayant des incapacités étaient inscrits à votre institution éducationnelle lors de la dernière année académique – tout les types de handicaps confondus.

5. INCAPACITÉS SPÉCIFIQUES ET TECHNOLOGIES

Pour les fins de cette étude, nous aimerions savoir si des étudiant(e)s ayant les incapacités suivantes sont inscrits à votre institution.

a. des étudiant(e)s totalement non-voyant(e)s

b. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

c. des étudiant(e)s qui ont une déficience visuelle / semi-voyant(e)

d. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

e. des étudiant(e)s qui sont sourd(e)s

f. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

g. des étudiant(e)s ayant une déficience auditive

h. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

i. des étudiant(e)s ayant des troubles d'apprentissage

j. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

k. des étudiant(e)s utilisant un fauteuil roulant ou des étudiant(e)s ayant des limitations à la marche?

l. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

m. des étudiant(e)s ayant des difficultés avec l'usage de leurs mains

n. Est-ce que votre institution possède certaines technologies informatiques spécialisées pour eux (elles)? Produites par qui / de quel genre?

o. des étudiant(e)s ayant d'autres types de handicaps/d'incapacités?

p. Est-ce que votre institution possède des technologies informatiques spécialisées/adaptées pour eux (elles)? Produites par qui / de quel genre?

6. ACCÈS À L'INTERNET

a. Est-ce que votre établissement post-secondaire fournit un accès à l'Internet?

b. Y a-t-il des ordinateurs adaptés permettant l'accès à l'Internet?

7. CENTRALISATION

Est-ce que les technologies informatiques adaptées pour les étudiant(e)s ayant des incapacités sont centralisées dans un lieu ou est-ce qu'elles sont dispersées parmi les divers immeubles ou campus de votre institution éducationnelle?

8. COMMENT OBTENUE

a. Qui paye les technologies informatiques spécialisées pour les étudiants ayant des incapacités dans votre établissement?

b. Y a-t-il des problèmes associés à la méthode avec laquelle votre institution a obtenue les technologies informatiques spécialisées, et si tel est le cas, avez-vous des solutions à proposer face à ces problèmes?

9. ACHAT DES TECHNOLOGIES D'APPRENTISSAGE - LE PROCESSUS DE PRISE DE DÉCISION

Comment est-ce que les décisions sont prises dans votre établissement quant au choix des technologies informatiques spécialisées qui seront achetées pour les étudiant(e)s handicapé(e)s?

10. HEURES D'ACCESSIBILITÉ

En général, est-ce que les étudiant(e)s ayant des incapacités peuvent avoir accès aux technologies informatiques spécialisées dans votre établissement :

a. pendant les heures régulières d'ouvertures?

b. pendant les heures du dîner?

c. en soirée lorsque l'établissement est ouvert?

d. pendant les fins de semaine lorsque l'établissement est ouvert?

11. PRÊT DES TECHNOLOGIES

a. Est-ce que votre établissement prête des ordinateurs aux étudiant(e)s ayant des incapacités?

b. Décrivez-moi comment votre programme fonctionne.

12. AVANTAGES ET DÉSAVANTAGES

Quels sont, selon vous, les avantages et les désavantages des technologies informatiques pour les étudiant(e)s ayant des incapacités?

13. NON-UTILISATEURS / NON-UTILISATRICES

a. Y a-t-il des étudiant(e)s ayant des incapacités dans votre institution qui pourraient bénéficier des technologies d'apprentissage mais qui ne les utilisent pas?

b. Quelles sont selon vous certaines des raisons pour lesquelles certains étudiant(e)s qui pourraient bénéficier des technologies d'apprentissages ne les utilisent pas – quelles raisons est-ce que les étudiant(e)s ont donné pour justifier leur non-utilisation de ces technologies?

14. PERSONNES RESSOURCES - APPRENTISSAGE DES TECHNOLOGIES

a. Comment est-ce que les personnes en charge des technologies informatiques spécialisées pour les étudiant(e)s ayant des incapacités apprennent à utiliser cet équipement?

b. Est-ce que cette méthode d'apprentissage fonctionne bien pour vos employé(e)s et sinon, quelle méthode pourrait mieux fonctionner?

15. ÉTUDIANT(E)S - APPRENTISSAGE DES TECHNOLOGIES

a. Comment est-ce que les étudiants ayant des incapacités apprennent à utiliser les technologies informatiques adaptées dans votre établissement?

b. D'après-vous, est-ce que cette méthode d'apprentissage fonctionne bien pour les étudiant(e)s handicapé(e)s et sinon, quelle méthode pourrait mieux marcher?

16. NOUVELLES TECHNOLOGIES INFORMATIQUES

Comment apprenez-vous que de nouvelles technologies informatiques pourraient être utiles pour les étudiant(e)s ayant des incapacités?

17. LISTE DE SOUHAITS

a. Quelle est votre liste de souhaits en ce qui relève des technologies informatiques pour les étudiant(e)s ayant des incapacités (dans votre bureau d'aide aux étudiant(e)s handicapé(e)s/laboratoire spécialisé, à la bibliothèque, ailleurs dans votre institution) – qu'est-ce que vous aimeriez voir amélioré, changé, modifié, développé (...)?

b. Qu'est-ce qui vous empêche d'obtenir les items sur votre liste de souhaits et qu'est-ce qui pourrait être fait pour que vous les obteniez?

18. AUTRES SUJETS

a. En terme d'accessibilité des technologies informatiques pour les étudiant(e)s ayant des incapacités, quels sont les aspects les mieux réussis et les moins réussis dans votre institution?

b. Y a-t-il d'autres sujets qui sont pertinents pour vous par rapport aux technologies informatiques que je n'ai pas soulevés, si oui lesquels?

Nous avons complété l'entrevue. Merci pour votre collaboration.

Appendix 7

Phase II: Students' Responses Concerning How Their Disabilities/Impairments Affect Their Lives At School

Illustration 8

How Students' Disabilities Affect Their Lives At School: Phase II Responses

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Material Based Assistance

- *I can't read overheads; get notes from other students or talk to profs; can't read from blackboard so I get notes from other students or the prof; extra time for exams*
- *If I don't have the right equipment then it will affect how I perform*
- *I can't keep up with assigned readings; I need extensions on papers and exams; catalogues in library are too small to read*

Identification Of Problems

- *Everything takes longer (studying); I have less energy; extra time for exams*
- *Hard to recognise speech when one talks with accents; large groups are difficult; seminar classes are not accessible due to lack of technology; background noise in computer labs is distracting - it's difficult to have a conversation; I have to be careful in library because I speak loudly; profs/tutorial or lab advisor are difficult to understand due to their language accent*

Academic Difficulties And Time

- *Difficulty retaining information because of LD; hard to decipher what notes are important to take so I would "write a book"; difficulty understanding questions on exams; extra time for exams; feel pressure when writing exams because instructors didn't always know about LD (learning disability) and I didn't always get extra time; I lose marks on spelling in class tests - this makes me more anxious*
- *Takes me longer to take my books out of my bag; I get my notes from other people because I can't write; I orally tell scribe what to write when I am doing an exam; because I have to arrange transportation to and from school I cannot attend any activities on short notice*
- *Difficulty with spelling, math, reading lists of words; difficulty keeping up with taking notes off blackboard - they write faster than I write because my spelling is poor and it takes me longer to write; sometimes I jump around sentences when I copy off the board*
- *Trouble reading and writing; misread things including chemicals in lab when doing experiments - this could result in someone getting hurt*
- *Lots of material to learn and memorising for tests is difficult - I don't retain a lot of what I read*
- *I am ADD (since two months); I have carpal tunnel syndrome; I can't retain what I am reading; can't apply what I am learning; I can't write long-term; I finger type; can't write fast enough to get important info and can't remember it to write later; can't sit for long periods of time without proper back support due to back injury; back and wrists flare up at the same time*
- *Do not have time to join clubs because it takes all my time to do school work; worked twice as hard at thinking; poor note taking - I don't always understand my notes- hard to keep up with what the teacher is saying*
- *Some days I can't read; 7 years ago I was completely illiterate; poor math skills; reading at grade 3 level; comprehension is way above grade 3 when I read (100%); I read at a context level - if I don't know the context before reading I get 60-70% of the information; carpal tunnel syndrome (use braces); I am outspoken and that turns people off; I can't judge distance so I generally get in people's faces (spatial problems); try too hard to make friends (self conscious because of my disability); family life and social life suffer because I am constantly studying*
- *I have difficulty copying off the overheads and blackboard; difficulty reading textbooks*

- *Have a learning disability and find it hard to work and go to school at the same time; difficult to participate in extra-curricular activities; need extra time to complete assignments; I need understanding from professors and classmates*
- *Takes me twice as long to do my work; hard to take part in study groups because I can't follow conversations because I have to lip read*

Non-Academics

- *I can't do gym because of functional disability in hands; have note takers; write essay tests on computer*
- *Can't participate in a lot of sports; getting around is hard because I am at a big campus with lots of little places to go*
- *I can't take part in certain forums at school because the material is in print form*

People Assistance

- *Friends walk me from class to class; friends walk me back to my apartment; do exams orally; do exams in Braille; someone comes to the library with me to help me do research and look up info on databases*
- *Je suis aveugle et dans mes laboratoires d'anatomie ou en biomechanique c'est beaucoup plus difficile pour moi puisque c'est très visuel; par exemple, en anatomie, comme je ne vois pas les muscles comme tout le monde, il faut que j'aille les palper et que quelqu'un m'aide; a la bibliothèque aussi j'ai de la difficulté parce que je ne peux pas faire de recherches seul (ex., sur Medline) alors j'ai toujours besoin d'un accompagnateur; enfin, dans les études tout me prend plus longtemps à faire que les autres étudiants - si je mets le temps supplémentaire mes notes sont bonnes mais ça fait plus de travail qu'un autre étudiant pour le même résultat*
- *Pas de documentation faites pour moi à la bibliothèque; besoin d'assistance-guide*
- *Ça me limite pour l'écriture la lecture; j'ai besoin d'un professeur particulier pour m'aider avec mes travaux*
- *Wait for people to take me where I need to get around the school; notetakers; tutors; large print; books on tape; I don't take part in anything at school other than classes; many students are writing exams at the same time and I can't concentrate with others in the room because my hearing is acute*

Environmental Issues

- *Materials read on tape was an issue; difficulty accessing the internet; math equations were difficult for computer (for the speech package to properly read them); I was given an office because of speech on computer because it would disturb other students; I have to wait for material to be put on tape; oral exams; behind other students all the time; have to study much longer hours; have to be very organized - I felt like an administrator; performed equally with others but worked twice as hard; difficulty concentrating; tired at times; tape some lectures; teachers did not always say what was written on the blackboard; some teachers who primarily spoke other languages were difficult to understand; always a distinction no matter how hard you tried and succeeded; always having to prove myself*

- *More time on tests; use computers during exams with an instructor present; use spell check; use grammar check; type assignments on computers; have a proofer - someone who checks my work; note taker; tutor which I pay for*
- *Books too high on shelves in library; elevator too narrow - I get stuck; rent hotel rooms because there are no housing arrangements for students who live far and don't need to be at school all the time; difficulty writing - can't take notes in class by hand; home library because I can't get help on the spur of the moment or travel so far all the time to go to school library; use lap top to take notes; difficulty hearing instructor or questions from students; can't put hearing aid in due to problem with fingers; miss info in large groups*
- *Some doors are hard to open; one elevator in school and it's a long way to get to it*
- *Visual impairment makes it difficult to get materials for researching essays; being deaf makes it difficult to hear what the lecturer is saying; if a classroom or any area of school is not accessible for a wheelchair then what am I to do? most student clubs are inaccessible due to long steep stairs*
- *Try to find out if books for school are on tape ahead of time; I have gone to the publisher and once received a copy of the book on disk; did math problems on Braille then had it transcribed into print for teacher or read it to them orally or did work on tape; for math hired students who would read solution sets onto tape for me; chemistry lab partner did experiments and explained what was going on; could not do microscope work in biology lab; go with someone to consult references*

Appendix 8

Phase III: Student Questionnaire Packages

Cover Letter, Consent Form, Questionnaire

English & French

DAWSON
COLLEGE

3040 Sherbrooke St. West
Montreal, QC, Canada
H3Z 1A4

Winter, 1999

Dear Current or Former Student

We know that computers and the internet are changing teaching and learning in postsecondary education. To help us better understand some of the changes and the ways in which these affect students with disabilities, we would appreciate if you would take the time to complete and return this survey.

Whether you use a computer or not, we are interested in your views and experiences. The goal of our research is not only to describe what is currently happening but also to help in decision making that ensures that new policies, software and hardware reflect the needs and concerns of college and university students with disabilities.

The survey is also your opportunity to make your feelings known to the people who make decisions about equipment for students with disabilities, including service providers at your college or university. As you will read on the enclosed "Informed Consent" document, your responses will remain anonymous. If you are interested, we can also send you a report about the findings. This will give you an idea about what others are doing and thinking and may help you advocate for better funding.

This research is being carried out in partnership with the National Educational Association of Disabled Students (NEADS). In addition, the Quebec Association of Disabled Students in Post-Secondary Education (AQEHPS) is also associated with our research team. In addition, large numbers of service providers across Canada are helping us distribute questionnaires to students.

This survey is available in regular and large print, audio tape, Braille and disk (IBM and Mac). If you prefer an alternate format or if you are missing the self-addressed stamped envelope, please phone our Help Desk collect at (514) 488-2376 Monday through Thursday from 6 P.M. to midnight and Sundays from 3 P.M. to midnight Eastern time. You can also e-mail us at: adaptech@concordia.ca.

Please return the questionnaire 2 weeks after you receive it.

Thank you.

Catherine S. Fichten, Ph.D.
514-931-8731 #1546 (tel)
514-340-7507 (fax)
md71@musica.mcgill.ca

Maria Barile, M.S.W.
514-931-8731 #1533 (tel)
514-340-7507 (fax)
mdb2@musica.mcgill.ca

Jennison Asuncion, B.A.
514-931-8731 #1533 (tel)
514-340-7507 (fax)
j_asunc@alcor.concordia.ca

DAWSON
COLLEGE

3040 Sherbrooke St. West
Montreal, QC, Canada
H3Z 1A4

Winter, 1999

Informed Consent: Adaptech Project

1. The purpose of this Canada-wide grant funded investigation is to evaluate the use and the utility of computer technologies in the postsecondary education of students with disabilities.

2. I understand that I am asked to participate in this study by completing a brief questionnaire in a format suitable for me. I understand that if I prefer an alternate format or if I am missing the self-addressed stamped envelope, I can phone the Help Desk collect at (514) 488-2376 Monday through Thursday from 6 P.M. to midnight and Sundays from 3 P.M. to midnight Eastern time or I can e-mail the researchers at adaptech@concordia.ca .

3. This questionnaire is concerned with computer, information and adaptive technologies in the postsecondary context. I understand that my name will not appear on any questionnaires, that my participation is completely anonymous, and that all information I provide will be kept strictly confidential and will not be used for any purposes other than this study.

4. I understand that I am free to ask any questions concerning the methodology of this study at any time. If for any reason I experience any discomfort or concern during my participation in this project, I understand I am free to discuss this with the project's directors, Dr. Catherine Fichten (514-931-8731 ext. 1546; e-mail: md71@musica.mcgill.ca) and Ms. Maria Barile (514-931-8731 ext. 1533; e-mail: mdb2@musica.mcgill.ca). I understand that I am free to participate or not, and that I have the option of terminating my participation in this study at any time.

5. I understand that if results of this study are published, any information I provide will remain strictly confidential, and that my privacy will be completely protected. I understand that any statements I make will never be linked to either myself or to my institution.

6. I understand that by responding to the questionnaire I agree to have the data I provide included in the study on the use and the utility of computer technologies in the post-secondary education of students with disabilities.

✂- -

Send Copy of Findings

If you want a copy of the findings (6 months to 1 year from now) please send us the following information. If you want to know more about the National Educational Association of Disabled Students (NEADS), indicate this also. *Please separate this form from the survey.*

Name: ______________________________

Address: ______________________________

____

E-Mail: ______________________________

Preferred format and language: ______________________________

Information about the National Educational Association of Disabled Students: __________

ph3rege doc December 10, 1998

ADAPTECH PROJECT COMPUTER AND INFORMATION TECHNOLOGIES SURVEY OF POSTSECONDARY STUDENTS WITH DISABILITIES

Dawson College, Montreal, Quebec Canada H3Z 1A4
1999

Help Desk. *If you have any problems or questions, feel free to call our Help Desk collect at (514) 488-2376 Monday through Thursday from 6 P.M. to midnight and Sundays from 3 P.M. to midnight Eastern time. You can also e-mail your questions to adaptech@concordia.ca .*

1. Are you female or male? Check one. ____ female ____ male

2. How old are you? __________

3. Which language do you speak more often? Check one. ____ English ____ French

4. What province/territory are you considered a resident of? (e.g., for voting, income tax - if you are an international student, specify country) ______________________________

5. What is the name of your educational institution and where is it located?
Name of institution: ______________________________
City: ____________________ Province/Territory: ____________________

6. What is your field of study? ______________________________

7. Which of the following are you currently pursuing? **Choose only one**.

_____ a. college certificate/diploma
_____ b. university degree
_____ c. I have not been a student since 19____ (specify year)
_____ d. other (e.g., just taking courses) - specify situation: ____________________

8. We would like to know what disabilities / impairments you have and how long you have had them. Please place number beside **all that apply** from the list below using a 3-point scale as follows:

1 = all or most of my life (before age 10)
2 = part of my life
3 = recent (past 3 years)

For example, if you have been totally blind all of your life, you would write 1 in the space before item a.

_____ a. totally blind
_____ b. visually impaired / partially sighted
_____ c. Deaf
_____ d. hearing impaired / hard of hearing
_____ e. speech or communication impaired
_____ f. learning disabled
_____ g. wheelchair user
_____ h. mobility impaired (e.g., walk with difficulty, use a cane)
_____ i. difficulty using hands/arms
_____ j. health or medically related impairment (e.g., diabetes)
_____ k. psychological or psychiatric disability
_____ l. other (specify impairment / disability) ____________________

9. Please check yes or no for **all** items.

At home I use:
a. a desktop computer ____ yes ____ no
b. a laptop computer ____ yes ____ no
c. adaptive computer hardware (e.g., Braille display) ____ yes ____ no
d. adaptive software (e.g., software that enlarges what is on the screen) ____ yes ____ no
e. the internet ____ yes ____ no
f. other computer technology ____ yes ____ no (specify technology) ____________________

10. Please check **all** items that apply.

I don't have the following technologies at home, but wish I did:
a. a desktop computer ____
b. a laptop computer ____
c. adaptive computer hardware (e.g., Braille display) ____
d. adaptive software (e.g., software that enlarges what is on the screen) ____
e. the internet ____
f. other computer technology ____ (specify technology) ____________________

11. Please check yes or no for **all** items.

At my educational institution I have used:
a desktop computer ____ yes ____ no
b. a laptop computer ____ yes ____ no
c. adaptive computer hardware (e.g., Braille display) ____ yes ____ no
d. adaptive software (e.g., software that enlarges what is on the screen) ____ yes ____ no
e. the internet ____ yes ____ no
f. other computer technology ____ yes ____ no (specify technology) ____________________

12. Please check **all** items that apply.

I have had no access to the following technologies at my educational institution, but wish I did:
a. a desktop computer ____
b. a laptop computer ____
c. adaptive computer hardware (e.g., Braille display) ____
d. adaptive software (e.g., software that enlarges what is on the screen) ____
e. the internet ____
f. other computer technology ____ (specify technology) ____________________

13. **Rate your level of agreement with the statements listed below.** Refer to your current situation. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree.

1 = strongly disagree
2 = somewhat disagree
3 = slightly disagree
4 = slightly agree
5 = somewhat agree
6 = strongly agree

______ a. In general, I rarely use computer technologies.
______ b. In general, I consider my level of expertise with computer technologies to be very good.
______ c. Computer technologies that meet my needs are unavailable to me.
______ d. Getting my work done more easily is important to me.
______ e. I am a person who dislikes computers.
______ f. There are opportunities for me to learn how to use computer technologies.
______ g. Computer technologies are inadequate in meeting my needs effectively (e.g., too inaccurate or slow).
______ h. I do not plan to become more knowledgeable about computers.
______ i. What friends think about computers is unimportant to me.
______ j. When I have problems with my computer technologies, I can get help easily.

______ k. Computers crash often.
______ l. Computer technologies I need cost too much.
______ m. I think working efficiently on computers is unimportant.
______ n. Using computer technologies effectively is likely to help me get my work done more easily.
______ o. Friends don't think using computers is helpful.
______ p. In general, there are good computer facilities for me to use.
______ q. I can comfortably use computer technologies if I need to.
______ r. There are people available to show me how to use computer technologies.
______ s. My friends think I should use computer technologies.
______ t. In general, my financial situation allows me to meet my needs.
______ u. Overall, I am very dissatisfied with my experiences with computers.

14. Rate your level of agreement with the statements listed below. Use the six-point scale above, with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

Please indicate the product names if you know them.

The following adaptive computer technologies are/could be useful in getting my work done:

______ a. a screen reader (software that reads what's on the screen) - product name:______________
______ b. software that enlarges what is on the screen - product name:______________
______ c. a scanner - product name:______________
______ d. Braille translation software - product name:______________
______ e. a portable note taking device (not referring to a laptop) - product name:______________
______ f. a large screen monitor - product name:______________
______ g. a Braille printer - product name:______________
______ h. a spell checker / grammar checker - product name:______________
______ i. other specialized software for learning disabilities (e.g., word prediction) - product name:__________
______ j. keyboard adaptations (e.g., "sticky keys") - product name:______________
______ k. mouse adaptations (e.g., head mouse, track ball) - product name:______________
______ l. dictation software (voice recognition software that types what you say) - product name:____________
______ m. voice control software (you give voice commands like "file," "open," - e.g., VoicePad) - product :________
______ n. having material available in electronic format (e.g., books, hand-outs)
______ o. other (specify adaptive hardware / software and product name) ________________________

15. Which of the following suggestions would you like to make to adaptive computer hardware and software companies? **Check 5 of the 12** suggestions listed below that are most important to you.

a. provide student discounts _____
b. provide trial periods _____
c. make product more user friendly _____
d. provide better technical support _____
e. ensure that advertising reaches students with disabilities _____
f. make adaptive hardware and software less expensive to purchase _____
g. make manuals/tutorials available in alternative formats _____
h. make manuals/tutorials easier to understand _____
i. when designing a piece of hardware or software, include accessibility features for a variety of users with disabilities _____
j. provide grants to educational institutions to purchase equipment _____
k. provide training _____
l. other (specify suggestion) ________________________________

16. **Do you use a computer?** ____ yes ____ no

If you answered "YES," skip the rest of this question and go to number 17.

If you answered "NO," rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

1 = strongly disagree
2 = somewhat disagree
3 = slightly disagree
4 = slightly agree
5 = somewhat agree
6 = strongly agree

I do not use a computer because:

_____ a. it is unavailable to me
_____ b. it costs too much
_____ c. I am not interested in using it
_____ d. it is too difficult to learn
_____ e. it is too expensive to maintain
_____ f. I don't know how to use it
_____ g. the technology makes me anxious
_____ h. I am uncertain about where to buy it
_____ i. adaptive technology I need to access a computer works poorly for me
_____ j. It is impossible for me to get it through a government program or an educational institution lending program
_____ k. available computers don't have appropriate adaptive hardware/software on them
_____ l. other (specify reason) ________________

IF YOU **DO NOT USE** A COMPUTER, GO TO THE LAST QUESTION, NUMBER 29.
IF YOU **DO USE** ONE, CONTINUE WITH THE NEXT QUESTION.

17. Please check yes or no for **all** items.

What type of computer do you use?
a. IBM compatible ____ yes ____ no
b. Macintosh ____ yes ____ no
c. other type of computer ____ yes ____ no (if you answered yes, specify type) ________________

18. Please check yes or no for **all** items.

I have used a computer:
a. at home ____ yes ____ no
b. during class lectures (e.g., writing lecture notes, in-class assignments) ____ yes ____ no
c. in the library (e.g., doing assignments on a computer located in the library) ____ yes ____ no
d. in a Disabled Student Services Office / specialized lab ____ yes ____ no
e. in a computer lab ____ yes ____ no
f. at work ____ yes ____ no
g. elsewhere ____ yes ____ no (specify location) ________________

19. **Approximately** how much time during a typical school week have you spent;

a. using **a computer** - **not** including time spent on the internet (number of hours per week) _____
b. using **the internet** (number of hours per week) _____

20. **Do you use the internet?** ____ yes ____ no

If you answered " YES," skip the rest of this question and go to number 21.

If you answered "NO," rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. If an item is not applicable to you, write 9 in the space provided.

1 = strongly disagree
2 = somewhat disagree
3 = slightly disagree
4 = slightly agree
5 = somewhat agree
6 = strongly agree

I do not use the internet because:
_____ a. it costs too much
_____ b. I have no access to a computer that is equipped to go on-line
_____ c. the available browser / e-mail program (e.g., Netscape, Eudora) does not work well for me
_____ d. it is unavailable in my area
_____ e. I am not interested in using it
_____ f. some features of web sites are inaccessible to me
_____ g. it is not available at school
_____ h. it ties up the phone line
_____ i. other (specify reason) ________________

IF YOU **DO NOT USE** THE INTERNET, SKIP THE NEXT QUESTION, AND GO TO NUMBER 22.
IF YOU **DO USE** THE INTERNET, CONTINUE WITH THE NEXT QUESTION.

21. Rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. If an item is not applicable to you, write 9 in the space provided.

1 = strongly disagree
2 = somewhat disagree
3 = slightly disagree
4 = slightly agree
5 = somewhat agree
6 = strongly agree

I use the internet for:

_____ a. doing research
_____ b. e-mailing friends/family
_____ c. entertainment
_____ d. accessing library materials
_____ e. looking for a job
_____ f. taking courses on-line
_____ g. e-mailing my professors
_____ h. participating in listservs/news groups
_____ i. participating in chat rooms
_____ j. banking/shopping
_____ k. getting software / updates / demos
_____ l. other (specify activity) ________________

22. **Did you take advantage of a government program to obtain a computer or adaptive computer technologies?** ___ yes ____ no

If you answered " YES," skip the rest of this question and go to number 23.

If you answered "NO," rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

I did not take advantage of a government program to obtain a computer or adaptive computer technologies (e.g., Braille display, software that enlarges the screen) because:

_____ a. there were too many restrictions
_____ b. my own /my family's income was too high for me to qualify
_____ c. my disability was excluded by existing programs
_____ d. the waiting period was too long
_____ e. I did not want to take the required evaluation
_____ f. I was unaware that there were any programs out there for me
_____ g. I / my family preferred to buy the equipment I needed
_____ h. the process for applying was too complicated
_____ i. the equipment I need was unavailable through existing programs
_____ j. other (specify reason) ________________

IF YOU **DID NOT TAKE ADVANTAGE** OF A GOVERNMENT PROGRAM, SKIP THE NEXT QUESTION, AND GO TO NUMBER 24.

IF YOU **DID TAKE ADVANTAGE** OF A GOVERNMENT PROGRAM, CONTINUE WITH THE NEXT QUESTION.

23. Rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

My experience with a government program has been that:

_____ a. there were many restrictive rules and regulations
_____ b. I had no say in what hardware/software I received
_____ c. the equipment I received met my needs
_____ d. I received excellent training on the technology
_____ e. the waiting period was very long
_____ f. the program's documentation was unavailable in a format I could read myself (e.g., no large print or tape)
_____ g. the program was flexible in meeting my needs
_____ h. contacting the necessary people to discuss my needs was easy
_____ i. the process for applying was complicated
_____ j. the equipment I received was up-to-date
_____ k. the evaluation process was unpleasant
_____ l. other (specify experience) ______________________________

24. **Do you have a computer that you use at home?** ___ yes ____ no

If you answered " NO," skip the rest of this question and go to number 25.

If you answered "YES", answer the rest of the question.

How did you get your computer and/or your adaptive computer technologies as a student? Check **all** that apply.

a. through the Federal Government _____ (specify name of program) ____________________
b. through the Provincial Government _____ (specify name of program) ____________________
c. through a foundation/organization _____ (e.g., Kiwanis Club, Neil Squire Foundation - specify name of foundation / organization) ____________________
d. by borrowing it from my family/friends _____
e. from my family who bought it for me _____
f. by buying it myself _____
g. through my educational institution's lending program _____
h. other _____ (specify how you obtained it) ____________________

25. Rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

Computer technologies cause problems for me because:

_____ a. they are difficult to learn
_____ b. they cost too much to buy
_____ c. using them causes me physical discomfort
_____ d. they are frustrating / difficult to use
_____ e. they crash
_____ f. they need to be repaired often
_____ g. there are hardware and software compatibility problems (e.g., document saved on one computer does not work on another)
_____ h. they are inadequate in meeting my needs
_____ i. they have to be upgraded continuously
_____ j. they make me dependent on them
_____ k. computer labs where my courses are held lack suitable adaptations for me (e.g., no dictation software)
_____ l. manufacturers fail to support their products
_____ m. there are few opportunities for training on adaptive technologies
_____ n. other (specify problem) ______________________________

26. Rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank. If an item is not applicable to you, write 9 in the space provided.

I have had problems using computers at my educational institution because:

_____ a. using computer technology in class is disruptive (e.g., too noisy)
_____ b. my schedule and the hours of access to computers have been incompatible
_____ c. the computer programs I use at home are unavailable at my educational institution
_____ d. there has been insufficient technical support available to me
_____ e. using computer technologies in class makes me stand out
_____ f. computer labs/adaptive center have always been full
_____ g. there has been a lack of suitable adaptive technology for my disability
_____ h. I have received insufficient training on existing adaptive technology
_____ i. other (specify problem) _______________

27. **Do you need any special adaptations to use a computer?** ____ yes ____ no

If you answered " NO," skip the next question and go to the last one, number 29.

If you answered " YES," go to the next question, number 28.

28. **Do you use adaptive computer hardware or software?** ____ yes ____ no

If you answered " YES," skip the rest of this question and go to the last one, number 29.

If you answered "NO," rate your level of agreement with each of the statements below. Use a 6-point scale with 1 equalling strongly disagree, and 6 equalling strongly agree. Please do not leave any items blank If an item is not applicable to you, write 9 in the space provided.

I do not use adaptive hardware/software (e.g., Braille display, software that enlarges what's on the screen) because:

_____ a. it is unavailable to me
_____ b. it costs too much
_____ c. I am not interested in using it
_____ d. it is too difficult to learn
_____ e. it is too expensive to maintain
_____ f. I don't know how to use it
_____ g. the technology makes me anxious
_____ h. I am uncertain about where to buy it
_____ i. adaptive technology I need to use a computer works poorly for me
_____ j. it is impossible for me to get it through a government program or an educational institution lending program
_____ k. available computers don't have appropriate adaptive hardware/software on them
_____ l. other (specify reason) _______________

29. Please let us know if there are other computer technology issues that are important to you that we have not asked about. Also, put any comments about this questionnaire here.

MANY THANKS FOR HELPING US WITH THIS STUDY!

ph3letrf doc

DAWSON
COLLEGE

3040, rue Sherbrooke Ouest
Montréal (Québec) Canada
H3Z 1A4

Hiver, 1999

Cher étudiant actuel ou ancien

Nous savons que les ordinateurs et l'Internet changent l'enseignement et l'apprentissage au niveau de postsecondaire. Afin de nous aider à mieux comprendre certains des changements et comment ces derniers affectent les étudiants ayant des incapacités, nous apprécierions que vous preniez le temps de compléter et retourner ce questionnaire.

Que vous utilisiez ou non un ordinateur, nous nous intéressons à vos opinions et expériences. Le but de notre recherche est non seulement de décrire l'état actuel des choses, mais aussi de contribuer à la prise de décisions en nous assurant que les politiques nouvelles, les logiciels et les équipements matériels (*hardware*) reflètent les besoins et les préoccupations des étudiants handicapés de niveaux collégial et universitaire.

Cette enquête est aussi une opportunité d'exprimer vos sentiments aux personnes qui prennent les décisions par rapport aux équipements disponibles pour les étudiants ayant des incapacités, y compris les répondants locaux de votre collège ou université. Comme vous le lirez dans le document intitulé «Formulaire de consentement éclairé » ci-joint, toutes vos réponses demeureront anonymes. Si vous le désirez, nous pouvons également vous faire parvenir un rapport avec les résultats de l'enquête. Ceci vous donnera un aperçu de l'équipements que les autres utilisent et pourrait vous aider à obtenir plus de fonds.

Cette recherche est menée en collaboration avec l'Association nationale des étudiant(e)s handicapés de niveau postsecondaire (NEADS). De plus, l'Association québécoise des étudiants handicapés au postsecondaire (AQEHPS) est également associée à notre équipe de recherche. Aussi, un nombre important de répondants locaux à travers le Canada nous aident à distribuer ces questionnaires aux étudiants.

Ce questionnaire est disponible en format régulier, en gros caractères, sur cassette audio, en braille et sur disquette (IBM ou Mac). Si vous préférez un format substitut ou s'il manque l'enveloppe pré-adressée et timbrée, vous pouvez contacter le service d'aide. Composez le (514) 931-8731 poste 1533 (durant les heures d'affaires), si vous êtes de la région de Montréal. Si vous êtes de l'extérieur de Montréal, vous pouvez nous rejoindre, à frais virés, au (514) 488-2376, du lundi au jeudi de 18h00 à minuit, et les dimanches de 15h00 à minuit (heure de l'est).

S'il vous plaît retournez le questionnaire 2 semaines après l'avoir reçu.

Merci mille fois.

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DAWSON
COLLEGE

3040, rue Sherbrooke Ouest
Montreal (Québec) Canada
H3Z 1A4

Hiver, 1999

Formulaire de consentement éclairé : projet Adaptech

1. Le but de cette étude subventionnée, pan-canadienne est d'évaluer l'utilisation et l'utilité des technologies informatiques dans l'enseignement postsecondaire des étudiants ayant des incapacités.

2. Je comprends que l'on me demande de participer à cette étude en complétant un court questionnaire dans un format qui me convient le mieux. Je comprends que si je préfère un format substitut ou s'il me manque l'enveloppe pré-adressée et timbrée, je peut contacter le service d'aide. Composez le (514) 931-8731, ext. 1533 (durant les heures d'affaires) si vous êtes de la région de Montréal. Si vous êtes de l'extérieur de Montréal, vous pouvez nous rejoindre, à frais virés, au (514) 488-2376, du lundi au jeudi de 18h00 à minuit, et les dimanches de 15h00 à minuit (heure de l'est).

3. Ce questionnaire s'intéresse à l'utilisation des ordinateurs, des technologies de l'information et de la communication et des technologies adaptées dans le milieu postsecondaire. Je comprends que mon nom apparaîtra sur aucun des questionnaires et que toutes les informations que je fournirai demeureront strictement confidentielles et ne serviront qu'aux seules fins de la présente recherche.

4. Je comprends que je suis libre de poser n'importe quelle question concernant la méthodologie de cette recherche et, que si pour quelque raison que ce soit je suis inconfortable ou j'ai des interrogations, je peux en faire part aux directeurs du projet : Dr Catherine Fichten ((514) 931-8731 poste 1546, courrier électronique : md71@musica.mcgill.ca) ou Mme Maria Barile ((514) 931-8731 poste 1533, courrier électronique : mdb2@musica.mcgill.ca). Je reconnais être libre de participer ou de ne pas participer à cette étude et que je peux mettre fin à ma participation à tout moment.

5. Je comprends que si les résultats de cette étude sont publiés, l'information que j'y aurai fourni demeurera strictement confidentielle et que ma vie privée sera entièrement protégée. De même, je comprends qu'aucun des commentaires que je ferai ne seront liés à moi-même ou à mon établissement d'enseignement.

6. Je comprends qu'en répondant à ce questionnaire, je consens à ce que les données fournies soient incluses dans l'étude sur l'utilisation et l'utilité des technologies informatiques dans l'enseignement postsecondaire des étudiants ayant des incapacités.

✂ -

Envoyez une copie des résultats

Si vous souhaitez recevoir une copie des résultats (d'ici 6 mois à 1 an), s'il vous plaît envoyé nous les informations suivantes. Si vous désirez en savoir davantage sur l'Association nationale des étudiants handicapés du niveau postsecondaire (NEADS), indiquez le aussi. S'il vous plaît, séparé ce formulaire du reste du questionnaire.

Nom: ____________________

Adresse: ____________________

____

Courrier électronique : ____________________

Format et langue préférés : ____________________

Information sur l'Association nationale des étudiants handicapés du niveau postsecondaire : ______

LES ÉTUDIANTS HANDICAPÉS DE NIVEAU POSTSECONDAIRE ET LES TECHNOLOGIES D'APPRENTISSAGE INFORMATIQUES - UNE ENQUÊTE DU PROJET ADAPTECH

Collège Dawson, Montréal (Québec) H3Z 1A4
1999

Service d'aide. *Si vous avez un(e) quelconque problème ou question, n'hésitez pas à contacter notre service d'aide. Si vous appelez de la région de Montréal, appelez au (514) 931-8731 poste 1533, durant les heures d'affaires. Si vous téléphonez de l'extérieur de Montréal, vous pouvez nous rejoindre, à frais virés, au (514) 488-2376 du lundi au jeudi de 18h00 à minuit, et les dimanches de 15h00 à minuit (heure de l'est). Vous pouvez aussi correspondre par courrier électronique à : adaptech@concordia.ca*

(Le générique masculin est utilisé uniquement dans le but d'alléger la lecture de ce questionnaire.)

1. Êtes-vous une femme ou un homme ? Cochez l'un des deux. ____femme ____ homme

2. Quel âge avez-vous ? _________

3. Quelle langue utilisez-vous le plus souvent ? Cochez l'une des deux. ___ anglais ___ français

4. De quelle province / territoire êtes-vous considéré un résident ? (ex., pour voter, pour les fins d'impôts - spécifiez de quel pays vous venez si vous êtes un étudiant international)________________________

5. Quel est le nom de votre établissement d'enseignement et où est-il situé ?
   Nom de l'établissement: ____
   Ville: _________________________________ Province / Territoire:________________________

6. Quel est votre domaine d'étude ? ____

7. Parmi les options suivantes, laquelle poursuivez-vous à présent? **Choisissez-en une seule**.
   _____a. certificat / diplôme collégial
   _____b. diplôme universitaire _____
   _____c. je n'ai pas été un étudiant depuis 19___ (spécifiez l'année)
   _____d. autre (ex., je prends simplement des cours) – spécifiez la situation_______________________

8. Nous voudrions savoir quels(les) handicaps / incapacités vous avez et depuis combien de temps vous les avez. S'il vous plaît, indiquez **tout** ce qui s'applique à vous dans la liste ci-dessous en utilisant l'échelle à 3-points suivante:

   1 = toute ou la majorité de ma vie (avant l'âge de 10 ans)
   2 = une partie de ma vie
   3 = récemment (au cours des 3 dernières années)

   Par exemple, si vous avez eu une déficience visuelle complète toute votre vie, vous indiqueriez 1 devant l'espace de l'item a.

   _____a. déficience visuelle complète (cécité)
   _____b. malvoyant / fonctionnellement voyant
   _____c. déficience auditive complète (surdité)
   _____d. déficience auditive avec audition restreinte (malentendant)
   _____e. limitation à la communication orale
   _____f. trouble d'apprentissage
   _____g. utilisateur d'un fauteuil roulant
   _____h. déficience motrice (ex., difficulté à marcher, utilise une canne)
   _____i. limitation de l'utilisation des mains / des bras
   ____ j. déficience organique ou problème de santé (ex., le diabète)
   _____k. problème psychologique ou psychiatrique
   _____l. autre (spécifiez l'incapacité / la déficience) ___________________________________

9. S'il vous plaît, cochez oui ou non à **chacun** des items suivants.

À la maison j'utilise:

a. un ordinateur de table ___oui ___non
b. un ordinateur portatif ___oui ___non
c. des équipements matériels (*hardware*) adaptés (ex., afficheur braille) ___oui ___non
d. des logiciels adaptés (ex., logiciel d'agrandissement d'écran) ___oui ___non
e. l'Internet ___oui ___non
f. autres technologies informatiques ___oui ___non (spécifiez les technologies) _______________

10. S'il vous plaît, cochez **chacun** des items s'appliquant à vous.

Je n'ai pas les technologies suivantes à la maison, mais j'aimerais avoir:

a. un ordinateur de table_____
b. un ordinateur portatif _____
c. des équipements matériels (*hardware*) adaptés (ex., afficheur braille)_____
d. des logiciels adaptés (ex., logiciel d'agrandissement d'écran)_____
e. l'Internet _____
f. autres technologies informatiques _____ (spécifiez les technologies) __________________

11. S'il vous plaît, cochez oui ou non à **chacun** des items suivants.

Dans mon établissement d'enseignement j'ai utilisé:

a. un ordinateur de table ___oui ___non
b. un ordinateur portatif ___oui ___non
c. des équipements matériels (*hardware*) adaptés (ex., afficheur braille) ___oui ___non
d. des logiciels adaptés (ex., logiciel d'agrandissement d'écran) ___oui ___non
e. l'Internet ___oui ___non
f. autres technologies informatiques: ___oui ___non (spécifiez les technologies) _________________

12. S'il vous plaît, cochez **chacun** des items s'appliquant à vous.

Je n'ai eu pas accès aux technologies suivantes dans mon établissement d'enseignement, mais j'aimerais avoir :

a. un ordinateur de table _____
b. un ordinateur portatif _____
c. des équipements matériels (*hardware*) adaptés (ex., afficheur braille)_____
d. des logiciels adaptés (ex., logiciel d'agrandissement d'écran)_____
e. l'Internet _____
f. autres technologies informatiques _____ (spécifiez les technologies) _____________________

13. **Indiquez dans quelle mesure vous êtes d'accord avec les affirmations suivantes.** Référez-vous à votre situation actuelle. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord.

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

______a. En général, j'utilise rarement des technologies informatiques.
______b. En général, je considère que mon niveau d'expertise au sujet des technologies informatiques est très élevé.
______c. Les technologies informatiques qui subviennent à mes besoins ne sont pas disponibles.
______d. Compléter mon travail plus facilement est important pour moi.
______e. Je suis une personne qui n'aime pas les ordinateurs.
______f. Il y a des occasions pour moi d'apprendre à utiliser les technologies informatiques.
______g. Les technologies informatiques sont inadéquates pour répondre à mes besoins (ex., elles font trop d'erreurs, elles sont trop lentes).
______h. Je n'ai pas l'intention d'approfondir mes connaissances en matière d'informatique.
______i. Je suis indifférent face à ce que mes amis pensent de l'informatique.
______j. Quand j'ai des problèmes avec les technologies informatiques, je peux obtenir de l'aide facilement.

______k. Les ordinateurs bloquent (*crash*) souvent.
______l. Les technologies informatiques dont j'ai besoin coûtent trop cher.
______m. Je pense qu'il n'est pas important de travailler de manière efficace sur les ordinateurs.
______n. Utiliser les technologies informatiques efficacement est susceptible de m'aider à faire mon travail plus facilement.
______o. Mes amis ne pensent pas que l'utilisation des ordinateurs est utile.
______p. En général, il y a de bonnes installations d'ordinateurs à ma disponibilité.
______q. Je peux confortablement utiliser les technologies informatiques si j'en ai besoin.
______r. Il y a des personnes disponibles pour me montrer comment utiliser les technologies informatiques.
______s. Mes amis estiment que je devrais utiliser les technologies informatiques.
______t. En général, ma situation financière me permet de subvenir à mes besoins .
______u. De manière globale, je suis très insatisfait de mes expériences avec les ordinateurs.

14. Évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

S'il vous plaît, indiquez la marque du produit, si vous la connaissez.

Les technologies informatiques adaptées suivantes sont / pourraient être utiles pour m'aider à compléter mon travail:

____ a. un logiciel de revue d'écran (un logiciel qui lit ce qui apparaît à l'écran) - marque du produit ______
____ b. un logiciel qui agrandit ce qui apparaît à l'écran - marque du produit ____________
____ c. un scanneur (*scanner*) - marque du produit ____________
____ d. un logiciel de conversion braille - marque du produit ______________
____ e. un système de prise de notes portatif (ne fait pas appel à un ordinateur portatif) - marque du produit _______________
____ f. un grand écran - marque du produit _______________
____ g. une imprimante braille - marque du produit ______________
____ h. un vérificateur d'orthographe / vérificateur de grammaire - marque du produit _______________
____ i. autres logiciels spécialisés pour les étudiants ayant des troubles d'apprentissage - marque du produit ___________________
____ j. des claviers d'ordinateurs adaptés (ex., touches rémanentes (*sticky keys*)) - marque du produit ______
____ k. des adaptations pour la souris (ex., une souris contrôlée par la tête, bille traçante (*trackball*)) - marque du produit ________________
____ l. un logiciel de dictée (logiciel qui dactylographie ce que l'on dit) - marque du produit ___________
____ m. un logiciel contrôlé par la voix (utilisation de la voix pour donner les commandes telles que « fichier » « ouvrir » « sauvegarder » - ex. VoicePad) - marque du produit ____________
____ n. avoir le matériel disponible en format électronique (ex., livres, recueil de notes)
____ o. autre (spécifiez quels logiciels / équipements matériels adaptés et marque du produit) ________

15. Lesquelles des suggestions suivantes aimeriez-vous adresser aux compagnies de logiciels et d'équipements matériels (*hardware*) adaptés? **Cochez 5 des 12 suggestions** qui sont les plus importantes pour vous.

a. fournir des rabais étudiants ______
b. offrir des périodes d'essai ______
c. rendre les produits plus faciles à utiliser ______
d. fournir un meilleur soutien technique ______
e. s'assurer que la publicité rejoigne les étudiants ayant des incapacités ______
f. rendre les logiciels et équipements matériaux adaptés moins dispendieux à acheter______
g. rendre les manuels et « tutoriels » disponibles en médias substituts ______
h. rendre les manuels et « tutoriels » plus faciles à comprendre ______
i. lors du développement d'équipements matériels ou de logiciels, inclure, dans le dessein, des options accessibles pour une variété d'utilisateurs ayant des incapacités ______
j. offrir des subventions aux établissements d'enseignement pour l'achat d'équipements ________
k. offrir une formation ______
l. autre (spécifiez la suggestion) ____

16. **Est-ce que vous utilisez un ordinateur?** ____oui ____non

Si vous avez répondu « OUI » sautez le reste de la question et allez directement à la question 17.

Si vous avez répondu « NON » évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

Je n'utilise pas un ordinateur parce que:

____a. cela ne m'est pas disponible
____ b. cela coûte trop cher
____ c. je ne suis pas intéressé à l'utiliser
____ d. il est trop difficile d'apprendre son fonctionnement
____ e. cela coûte trop cher à entretenir
____ f. je ne sais pas comment l'utiliser
____ g. la technologie informatique me rend anxieux
____ h. je ne suis pas sûr où je pourrais m'en procurer un
____ i. la technologie adaptée dont j'ai besoin fonctionne mal pour moi
____ j. il m'est impossible d'en obtenir un à travers un programme gouvernemental ou par un programme de prêt de mon établissement d'enseignement
____ k. les ordinateurs disponibles n'ont pas de logiciels / d'équipements matériels convenablement adaptés
____ l. autre (spécifiez la raison) ________________________________

SI VOUS **N'UTILISEZ PAS** UN ORDINATEUR, VEUILLEZ ALLER À LA DERNIÈRE QUESTION 29.
SI VOUS EN **UTILISEZ UN**, VEUILLEZ POURSUIVRE AVEC LA QUESTION SUIVANTE.

17. S'il vous plaît, cochez oui ou non à chacun des items suivants.

Quel type d'ordinateur utilisez-vous?

a. IBM compatible ____oui ____ non
b. Macintosh ____oui ____non
c. autre type d'ordinateur ____oui ____non (si vous avez répondu oui, précisez le type) ________________

18. S'il vous plaît, cochez oui ou non à **chacun** des items suivants.

J'ai déjà utilisé un ordinateur:

a. à la maison ____oui ____ non
b. en classe (ex., pour prendre des notes de cours, pour faire des travaux en classe) ____oui ____ non
c. à la bibliothèque (ex., pour écrire un travail sur un ordinateur situé dans la bibliothèque) ____oui ____ non
d. dans un bureau d'aide aux étudiants ayant des incapacités / laboratoire spécialisé ____oui ____ non
e. dans un laboratoire informatique ____oui ____ non
f. au travail ____oui ____ non
g. ailleurs ____oui ____ non (spécifiez l'endroit) ________________________

19. **Approximativement,** combien de temps, durant une semaine typique d'école, avez-vous passé à:

a. utiliser **un ordinateur** - **excluant** le temps passé sur l'Internet (nombre d'heures par semaine)_____

b. utiliser **l'Internet** (nombre d'heures par semaine) ________

20. **Utilisez-vous l'Internet?** ____oui ____ non

Si vous avez répondu « OUI » sautez le reste de cette question et allez directement à la question 21.

Si vous avez répondu « NON » évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

Je n'utilise pas l'Internet parce que:

_____ a. cela coûte trop cher

_____ b. je n'ai pas accès à un ordinateur équipé pour me brancher à l'Internet

_____ c. les fureteurs (*Browser*) / programmes de courrier électronique disponibles (ex., Netscape, Eudora) fonctionnent mal pour moi

_____ d. l'Internet n'est pas disponible dans ma région

_____ e. je ne suis pas intéressé à l'utiliser

_____ f. certains aspects des sites Web me sont inaccessibles

_____ g. l'Internet n'est pas disponible à l'école

_____ h. l'Internet occupe la ligne téléphonique

_____ i. autre (spécifiez la raison) ___________________________

SI VOUS **N'UTILISEZ PAS L'INTERNET**, SAUTEZ LA QUESTION SUIVANTE ET ALLEZ DIRECTEMENT À LA QUESTION 22.

SI VOUS **UTILISEZ L'INTERNET**, CONTINUEZ AVEC LA QUESTION SUIVANTE.

21. Évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Employez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

1= fortement en désaccord
2= assez en désaccord
3= un peu en désaccord
4= un peu d'accord
5= assez d'accord
6= fortement d'accord

J'utilise l'Internet pour:

_____ a. faire de la recherche

_____ b. communiquer par courrier électronique avec mes amis / ma famille

_____ c. divertissement

_____ d. accéder à du matériel de la bibliothèque

_____ e. rechercher un emploi

_____ f. suivre des cours sur l'Internet

_____ g. communiquer par courrier électronique avec mes professeurs

_____ h. participer à des groupes de discussions / groupes de nouvelles (*newsgroups*)

_____ i. faire du *chatting* (*chat rooms*)

_____ j. faire des transactions bancaires / achats

_____ k. obtenir des logiciels / des mises à jours / des démonstrations

_____ l. autre (spécifiez l'activité) _____________________________________

22. **Avez-vous bénéficié d'un programme gouvernemental pour obtenir un ordinateur ou des technologies informatiques adaptées?** _____oui _____non

Si vous avez répondu « OUI » sautez le reste de cette question et allez directement à la question 23.

Si vous avez répondu « NON » évaluez dans quelle mesure vous êtes d'accord avec chacune des affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

Je n'ai pas bénéficié d'un programme gouvernemental pour obtenir un ordinateur ou des technologies adaptées (ex., un afficheur braille, un logiciel qui agrandit l'écran) parce que:

_____ a. il y avait trop de restrictions

_____ b. mon revenu / le revenu de ma famille était trop élevé pour en bénéficier

_____ c. mon handicap / mon incapacité est exclus(e) par les programmes existants

_____ d. la période d'attente était trop longue

_____ e. je n'ai pas voulu compléter l'évaluation requise

_____ f. je ne savais pas que de tels programmes existaient pour moi

_____ g. je préférais / ma famille préférait acheter l'équipement dont j'avais besoin

_____ h. le processus d'application était trop compliqué

_____ i. l'équipement dont j'avais besoin n'était pas disponible à travers les programmes qui existent

_____ j. autre (spécifiez la raison) ______________________________

SI VOUS **N'AVEZ PAS BÉNÉFICIÉ D'UN PROGRAMME** GOUVERNEMENTAL, SAUTEZ LA PROCHAINE QUESTION ET ALLER À LA QUESTION 24.

SI VOUS **AVEZ BÉNÉFICIÉ D'UN PROGRAMME** GOUVERNEMENTAL, CONTINUEZ AVEC LA QUESTION SUIVANTE.

23. Évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Utilisez une échelle à 6 - points où 1 est égal à fortement en désaccord et 6 est égal à fortement en accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

Mon expérience avec le programme gouvernemental a été que :

_____ a. il y avait plusieurs restrictions et règlements

_____ b. je n'ai pas pu m'exprimer sur le choix des équipements matériels / logiciels que j'ai reçus

_____ c. l'équipement reçu comble mes besoins

_____ d. j'ai reçu une excellente formation sur les technologies

_____ e. la période d'attente était très longue

_____ f. la documentation sur le programme n'était pas disponible dans un média que je puisse lire moi-même (ex., pas de gros caractères ou de cassette audio)

_____ g. le programme a répondu à mes besoins avec flexiblité

_____ h. rejoindre les personnes nécessaires pour discuter de mes besoins a été facile

_____ i. le processus d'application a été compliqué

_____ j. l'équipement reçu était à jour

_____ k. le processus d'évaluation a été désagréable

_____ l. autre (spécifiez l'expérience) ______________________________

24. **Avez-vous un ordinateur que vous utilisez à la maison?** ____ oui ____ non.

Si vous avez répondu « NON » sautez le reste de la question et allez directement à la question 25.

Si vous avez répondu « OUI » répondez à la suite de cette question.

En tant qu'étudiant, comment avez-vous obtenu votre ordinateur et / ou vos technologies informatiques adaptées? Cochez **tous** les items qui s'appliquent à vous.

a. à travers le gouvernement fédéral ______ (spécifiez le nom du programme) __________________
b. à travers le gouvernement provincial _____ (spécifiez le nom du programme)_________________
c. à travers une fondation / organisme_____ (ex., Club Kiwanis, Fondation Neil Squire - spécifiez le nom de la fondation / de l'organisation)__________________________
d. en empruntant ceux-ci de ma famille / d'amis
e. de ma famille qui l'a acheté pour moi
f. en l'achetant moi-même
g. à travers le programme de prêts de mon établissement éducationnel
h. autre ____ (spécifiez comment vous les avez obtenu) ______________________________

25. Évaluez dans quelle mesure vous êtes d'accord avec chacune des affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

Les technologies informatiques causent des problèmes pour moi parce que:

_____ a. il est difficile d'apprendre leur fonctionnement
_____ b. elles coûtent trop cher à acheter
_____ c. leur utilisation me cause des malaises physiques
_____ d. elles sont frustrantes / difficiles à utiliser
_____ e. elles bloquent (*crash*)
_____ f. elles ont souvent besoin d'être réparées
_____ g. il y a des problèmes de compatibilité au niveau des logiciels et des équipements matériels (ex., un document sauvegardé sur un ordinateur ne fonctionne pas sur un autre)
_____ h. elles sont inadéquates face à mes besoins
_____ i. il est nécessaire de les remettre à jour continuellement
_____ j. elles me rendent dépendant d'elles
_____ k. les laboratoires informatiques où mes cours sont tenus manquent d'adaptations adéquates pour moi (ex., pas de logiciel de dictée)
_____ l. les manufacturiers manquent de soutien de leurs produits
_____ m. il manque d'occasions de formation sur les technologies adaptées
_____ n. autre (spécifiez le problème) ___________________________________

26. Évaluez dans quelle mesure vous êtes d'accord avec chacune des affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

J'ai eu des difficultés à utiliser les ordinateurs dans mon établissement d'enseignement parce que:

_____a. l'utilisation de technologies informatiques en classe dérange (ex., trop bruyant)

_____b. mon horaire et les heures d'accessibilité aux ordinateurs étaient incompatibles

_____c. les programmes que j'utilise à la maison ne sont pas disponibles dans mon établissement d'enseignement

_____d. le soutien technique, qui m'était disponible, a été insuffisant pour moi

_____e. utiliser les technologies informatiques en classe me met en évidence

_____f. les laboratoires informatiques / centres adaptés étaient toujours pleins

_____g. il y a un manque de technologies adaptées pour mon handicap / incapacité

_____h. j'ai reçu une formation insuffisante sur les technologies adaptées actuelles

_____i. autre (spécifiez le problème)____________________________________

27. **Est-ce que vous avez besoin d'adaptations particulières pour utiliser un ordinateur?** ____oui ____ non

Si vous avez répondu « NON » sautez la question suivante et allez directement à la dernière question, numéro 29.

Si vous avez répondu « OUI » allez à la question suivante, numéro 28.

28. **Est-ce que vous utilisez des logiciels et / ou des équipements matériels adaptés**? _____oui _____non

Si vous avez répondu « OUI » sautez la question suivante et allez directement à la dernière, numéro 29.

Si vous avez répondu « NON » évaluez dans quelle mesure vous êtes d'accord avec chacune des affirmations suivantes. Utilisez une échelle à 6-points où 1 est égal à fortement en désaccord et 6 est égal à fortement d'accord. S'il vous plaît, laissez aucun espace libre. Si un item ne s'applique pas à vous, répondez par 9 dans l'espace réservé.

Je n'utilise pas de logiciel ni d'équipement matériel adapté (ex., afficheur braille, logiciel qui agrandit ce qui apparaît sur l'écran) parce que:

____ a. cela ne m'est pas disponible

____ b. cela coûte trop cher

____ c. je ne suis pas intéressé à l'utiliser

____ d. il est trop difficile d'apprendre son fonctionnement

____ e. cela coûte trop cher à entretenir

____ f. je ne sais pas comment l'utiliser

____ g. la technologie informatique me rend anxieux

____ h. je ne suis pas sûr où je pourrais m'en procurer un

____ i. la technologie adaptée dont j'ai besoin fonctionne mal pour moi

____ j. il m'est impossible d'en obtenir un à travers un programme gouvernemental ou par un programme de prêt de mon établissement d'enseignement

____ k. les ordinateurs disponibles n'ont pas de logiciels / d'équipements matériels convenablement adaptés

____ l. autre (spécifiez la raison) ____

29. S'il vous plaît, laissez-nous savoir s'il y a d'autres sujets sur les technologies informatiques qui sont pertinents pour vous que nous n'avons pas soulevés. De même, veuillez inclure, à la page suivante, tous commentaires sur ce questionnaire.

MERCI MILLE FOIS POUR VOTRE CONTRIBUTION À CETTE ÉTUDE!

Appendix 9

Phase III: Pretest Interview Protocol

ph3pilqu.doc 13 June 1999

Phase 3 Pre Test Interview Protocol

1. How long did it take you to complete your survey?

2. What format of the questionnaire did you answer, and how well did it work for you?

3. What method did you use to respond to the questionnaire, and how well did it work for you?

4. In general, what did you like about the questionnaire's content, and what didn't you like about the content?

5. We will now ask you about the lay-out of the survey and what you thought of it.

   a. For print users: Tell us what you liked and what you didn't like about the visual lay-out of the questionnaire? Be specific (Was there enough space between questions? Was enough room provided to write your responses) and give us your suggestions for improvement both with the survey and consent form.

   b. For large print users: Tell us what you liked and what you didn't like about the visual lay-out of the questionnaire? Be specific (Was the print size comfortable? Was the print dark enough for you? Was there enough space between questions? Was enough room provided to write your responses) , and give us your suggestions for improvement both with the survey and consent form.

   c. For audio tape users: Tell us what you liked, and what you didn't like about the audio recording? Be specific (Was the reader too fast? too slow? Was the audio recording clear enough to understand?), and give us your suggestions for improvement both with the survey and consent form.

   d. For Braille users: Tell us what you liked, and what you didn't like about the lay-out of the Braille version? Be specific (Were their any Braille errors? Was there enough spacing?), and give us your suggestions for improvement both with the survey and consent form.

   e. For diskette users: Tell us what you liked, and what you didn't like about the lay-out of the disk version? Be specific (Were their any compatibility problems? Was it clear to you where to put your answers?), and give us your suggestions for improvement both with the survey and consent form.

   f. For print and tape users only: How did listening to the tape and following along with the print version work out for you? Were the special reader's notes helpful for you?

6. Did you find any of the questions offensive or inappropriate, if so, which ones and why?

7. Did you find any of the questions confusing, if so, which ones and why?

8. Were the instructions for each question clear, if not, which ones were not clear to you and why?

9. What questions were not on the survey that you think should be considered for the next version?

10. Was the consent form easy to understand and if not, what suggestions would you give us?

11. Were there any difficulties with any of the terms used in the questionnaire, and/or wrong uses of words?

Appendix 10

Phase III: Letter To Service Providers Soliciting Help With Questionnaire Distribution

DAWSON
COLLEGE

3040 Sherbrooke St. West
Montreal, QC, Canada
H3Z 1A4

(514) 931-8731

Re: Adaptech Project computer and information technologies survey of students with disabilities

Dear Colleague

As discussed on the telephone, we have enclosed the surveys on computers and postsecondary students with disabilities. We are delighted that you will be helping us with this pioneering research which involves surveying more than 3000 college and university students with disabilities across Canada. Your assistance in distributing questionnaires will ensure that we hear from a wide range of students with varying experiences involving computer technologies. Of course, we will send you a copy of the findings as soon as these become available (in the next 6 to 12 months).

Please distribute the questionnaire to students who use computers as well as to students who do not. Also, please distribute it to students with all types of disabilities and special needs. To accommodate the widest range of students, our survey materials are available in both English and French in regular and large print, Braille, audio tape, and IBM and Mac disk versions.

We have enclosed the number of surveys and the formats that you requested. If there is any problem with these or if you need additional copies, please let one of us know. You may also make additional copies of the survey and we invite you to share information about our project with colleagues who might be interested.

Please note that reports about the findings of this survey will not single out any postsecondary institution by name. We are interested in country-wide data rather than in information that is specific to particular schools. Thus, the information in surveys will never be linked either to individuals or to specific educational institutions.

This research is being carried out in partnership with the National Educational Association of Disabled Students (NEADS). In addition, the Quebec Association of Disabled Students in Post-Secondary Education (AQEHPS) is also associated with our research team. The project is funded by the Office of Learning Technologies - Human Resources Development Canada (OLT) and by the Social Sciences and Humanities Research Council of Canada (SSHRC). Our web site has additional information about our projects: http://omega.dawsoncollege.qc.ca/cfichten/adaptech.htm . Enclosed with this letter you will also find additional information about the Adaptech Project as well as our research team whose members are affiliated with both English and French universities and colleges.

Thanks again for your help.

Jennison Asuncion (514-931-8731 #1533, j_asunc@alcor.concordia.ca) on behalf of the Adaptech Project Directors:

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Appendix 11

Phase III: Listing Of Students' Responses Concerning The Brand Names Of Different Computer Technologies That Could Be Useful

Illustration 11

Phase III: Listing of Students' Responses: Adaptive Technologies That Are/Could Be Useful In Getting Their Work Done

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Clarification

When asked about which adaptive computer technologies are/could be useful in getting their work done, some respondents included product names. The following is a summary of those responses. Only a small percent of students wrote in product names. We have not edited these, although repetitions, for the most part, have been omitted.

Screen Readers (software that reads what's on the screen)

- *Acrobat Accessibility*
- *Arkenstone Unbound*
- *Artic*
- *Artic Win Vision*
- *IBM Screen Reader*
- *JAWS For DOS (JFD)*
- *JAWS For Windows (JFW)*
- *Job Access with Speech (JAWS)*
- *Macintosh*
- *Orison*
- *Proverbe*
- *Soft Vert*
- *Speak To Text*
- *Text Assist*
- *TextHelp*
- *Voice Pro*
- *V-Text*
- *Window Eyes*
- *Windows Bridge*
- *Zoom Text Extra Level 2*
- *Zoom Text Ultra*

Screen Enlargers (software that enlarges what's on the screen)

- *Any Word Processor*
- *Apple*
- *Arrow*
- *Bion Text*
- *Closeview*
- *Eye Relief*
- *Large Print DOS (LP DOS)*
- *Large Print Windows (LP Windows)*
- *Magic*
- *Smartview*
- *Windows Accessibility*
- *Word Processor Built-In Features*
- *Zoom Text Extra Level 2*
- *Zoom Text Ultra*
- *Zoomtext*
- *Zoomtext Level 1*

Scanners

- *Acer*
- *AGFA*
- *Apple*
- *Astra 610*
- *Canon*
- *Easy Photo*
- *Epson*
- *Flat bed*
- *Hewlett Packard*
- *IBM*
- *Imax*
- *Lexmark*
- *Microtech*
- *Olympus*
- *OMAX (Astra)*
- *Photomaker*
- *Reality Edge*
- *UMAX*
- *Viviscan*

Optical Character Recognition Software

- *Arkenstone (e.g., Open Book, Open Book Unbound)*
- *Kurzweil (1000, 3000)*
- *OmniPage*
- *OsCaR*
- *Reading Edge Machine (standalone hardware and software in one)*

Braille Translation Software

- *Braille Lite*
- *Duxbury*
- *Hot Dots*
- *Megadots*

Portable Note Taking Device (not referring to a laptop)

- *AlphaSmart*
- *Braille Lite*
- *Braille 'n Speak*
- *Braillemate*
- *Companion*
- *Envy*
- *Magnum*
- *Palm pilot*
- *Parrot*
- *Type ' n ' speak*

Large Screen Monitors

- *15 inch monitor*
- *17 inch monitor*
- *21 inch monitor*
- *CC TV screen*

Braille Printers

- *Blazer*
- *Braille Blazer*
- *Jueliet*
- *Okada*
- *Romeo*
- *VersaPoint*

Spell Checkers/Grammar Checkers

- *Any word processor (e.g., Corel, Word Perfect Canadian version, MS Word)*
- *Correcteur*
- *Franklin Language Master*
- *Hugo 8+*
- *Keyspell*
- *Laroudre F/A 101 (correcteur)*
- *Seiko Instrument*
- *Texas Instruments (pocket spell checker and spelling)*

Adaptive Software For Learning Disabilities

- *Co-Writer*
- *Dragon Products (e.g., Naturally Speaking)*
- *Handiword Sticky Keys*
- *IBM Via Voice*
- *Inspiration*
- *Openbook*
- *Talker*
- *Telepathic N/A8*
- *TextHELP*
- *True voice*
- *Via Voice*

Adaptive Keyboards

- *Clavier Français*
- *Ergonomic Keyboard*
- *Ergonomique Mustek Twainscan*
- *Glide Point*
- *Half QWERTY*
- *Left-Right-Separated*
- *Microsoft Comfort Board*
- *Microsoft Ergonomic Keyboard*
- *Microsoft Natural Keyboard*
- *Microsoft Soft Touch keyboard*
- *Protège Touche*
- *Sticky Keys And Key Guard*
- *Waveboard*

Adaptive Mouse

- *Cirque: wave keyboard avec souris intégrée, se dirige avec l'objet*
- *Click Less Mouse*
- *Decca*
- *Ergonomic*
- *Expert mouse*
- *Glide point*
- *Mouse Trails On And The Large Mouse Setting*
- *IntelliPoint*
- *Kensington*
- *L-cursor*
- *Light Pen*
- *Logitech mouse*
- *Madenta tracker*
- *Microsoft Ball*
- *Mouse Mover With Joystick*
- *TBM Numeric Keyboard*
- *Virtual Mouse*
- *Virtual Reality Mouse*
- *Wave Keyboard 2*

Dictation Software

- *Dictatype*
- *Dragon*
- *Dragon Dictate*
- *Dragon Naturally Speaking*
- *EUS-speak*
- *IBM Via Voice*
- *Simply Speaking*
- *Speak And Type*
- *True Voice*

Voice Control Software

- *Synthèse Éloquence*
- *Voice Direct*
- *VoicePad*

Other Adaptive Hardware/Software

This list was generated by the open-ended section of this question. This is a combination of wish list items and actual hardware/software. It gives a "snapshot" of what adaptive hardware/software means to different people.

- *A computer*
- *A palm top for notes*
- *A proper instruction and reference book for the computer. Like - where you could just look up a problem in an index - flip through the pages & find it quick, easy on the eyes, functional. The "help" screen is never useful never. It never answers my question it has no context, it hurts my eyes.*
- *A quick, user friendly, word processing program for math.*
- *ABBYY Fine reader*
- *Adaptable chair*
- *AudioCalc (4 in 1 talking mathematics, scientific, statistical and financial calculator)*
- *Books on tape*
- *CCTV*
- *CD ROM, Software that identifies and gives dimensions of graphics.*
- *Closed caption device*
- *C-Note System*
- *Combination-Portable CCTV + computer + scanner + voice I/O*
- *Computer table with an adjustable keyboard height, adjustable ergonomic keyboard and mouse*
- *Décodeur TV*
- *Direct connect to brain waves using EEG type equipment*
- *Electronic texts*
- *Expervision Typereader Pro*
- *FM system & C-Note with dictation software*
- *Footmouse*
- *Handwriting recognition*
- *Logiciel intégré a un système d'exploitation produisant les ondes alpha beta*
- *Microphone headset*
- *Opticon*
- *Organizing software*
- *Palm top, voice recording technologies*
- *Parrot 3+*
- *Pocket spell-checker*
- *Program to learn how to type*
- *Roget's thesaurus and spell checker from Seiko instruments*
- *Round diskette*
- *RSI friendly keyboard and devices*
- *Scientific writing software*
- *Software for Deaf/Hard of Hearing*
- *Software that can decipher graphics*
- *Stronger, glare free screens*
- *Systems for voice or one hand*
- *Tape recorder*
- *Terminology specific spelling software*
- *Traduction LSQ*
- *Une imprimante BJC-80 portable*
- *VisionKey de Eyecan ltée.*
- *Word prediction software*

Appendix 12

Phase III: Students' Responses: Organizations Which Fund Computer Technologies

Illustration 9

Phase III Student' Responses: Organizations Which Fund Computer Technologies

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Clarification

The following is an unedited list of students' responses to questions asking them about foundations and provincial and federal funding organizations. Because they are based on students' recollections of complex names and affiliations, these may contain duplications and errors.

Students obtained their technologies from a variety of sources. We provide this list simply as a source of ideas. In some cases there might have been confusion as to the exact names of programs or whether the programs are private or government funded or even the level of government providing these programs. The confusion may be explained, in part by the fact that while we were carrying out our research, the core funding programs administered by the majority of provinces were undergoing major administrative changes, including the name as noted by some students: "EAPD formally VRDP".

Foundations

- *Amputés De Guerre - New Brunswick*
- *Arthritis Association - Ontario*
- *BC Tri Employees - British Colombia*
- *IBM Excellence Scholarship Award – Alberta*
- *Kids' Speech And Insurance Company - Ontario*
- *Kiwanis Club - Alberta*
- *Lions Club - Abbottsford*
- *Masons - Manitoba*
- *Nib And EDRP - Adaptive Computer Technology - Saskatchewan*
- *Rice Bursary - Manitoba*
- *Rotary Club – Prince Edward Island*

Institutions That Provide /Administer Programs & Others Sources

- *A.L.D.A. - British Colombia*
- *Centre Louis Herbert - Quebec*
- *Institut Nazareth et Louis Braille - Quebec*
- *MAB (Montreal Association For The Blind) – Quebec*
- *OCTC (Ottawa Treatment Centre) - Ontario*
- *OPHQ (Office Des Personnes Handicapées Du Québec) - Quebec*
- *Vocational Rehabilitation – Nova Scotia*

Provincial Government Plan

- *ADP (Assistive Devices Program) - Ontario*
- *Adult Services - British Colombia*
- *Adult Student Services British Colombia Student Loan -Vancouver*
- *Allowance - Toronto*
- *AMEO (PAV – Programme d'Aide Visuelle) - Quebec*

- *Assistive Devices Program - Ontario*
- *BSWD - Ontario*
- *Bursary For Special Needs - Ontario*
- *Bursary For Students With Disabilities - Ontario*
- *Department Of Education - Kentville*
- *Disability Bursary - Kitchener*
- *Disability Program - Ontario*
- *Disability Services - North Vancouver*
- *Employability Assistance For People With Disabilities - Saskatchewan*
- *Micro Computer Loan*
- *Ministère De l'Éducation Du Québec Aide Financière Aux Étudiants (Material Resources)*
- *Ministère De l'Éducation Du Québec (Prêt Micro-Ordinateur)*
- *New Brunswick Tax Reduction*
- *Nova Scotia Tax Rebate*
- *ODSP - Ontario*
- *OGS - Nova Scotia*
- *Ontario Disabled Bursary*
- *OPHQ - Quebec*
- *OSAP - Ontario*
- *OSAP Special Needs Bursaries - Ontario*
- *PAV (Programme d'Àide Visuelle) - Quebec*
- *Program For Students With Learning Disabilities - Edmonton*
- *Programme TEST – Moncton - Moose Jaw*
- *Provincial Grant For People With Disabilities*
- *RAMQ - Quebec*
- *Rehabilitation Professional Assistant Device Program - Nova Scotia*
- *SET B.C. – British Columbia*
- *SOG (Special Opportunities Grant)*
- *Special Bursary Program - Ontario*
- *Special Needs Bursary*
- *Special Needs Grant*
- *STEP - Stephenville*
- *TSSP - Burnaby*
- *VRDP (Vocational Rehab For Disabled People) - Alberta*
- *VRS - Ontario*
- *WCB -Thunder Bay*
- *Worker's Compensation - Ontario*
- *WSIB - Ontario*

Federal Government Plan

- *ADP - Waterloo Ontario*
- *Adult Services Program (Adaptive Canada Study Grant) - Vancouver*
- *Bursary Through Fanshawe College - Ontario*
- *Canada Assistive Devices - Ontario*
- *Canada Student Loan - Adult Student Services*
- *Canada Study Grant For Part-Time Students - Vancouver*
- *Career Development And VRDP Program*
- *CSG (Canadian Study Grant)*
- *CSL - Nova Scotia*
- *EAPD (formerly VRDP)*
- *Ontario Disabled Bursary - Ontario*
- *OSAP - Ontario*
- *RSWD - Ontario*
- *SOG (Special Opportunity Grants)*
- *Student opportunity grant*

Appendix 13

Phase III: Students' Overall Comments About Computer, Information and Adaptive Technologies

Illustration 10

Students' Overall Comments About Computer Information And Adaptive Technologies: Phase III Responses

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Lack of Information

- *Access to information to solve problems when they arise*
- *Access to research information and products*
- *As a present student, I would have appreciated having the knowledge about adaptive computer equipment before I started college. I'm not even sure that I yet know of all the equipment which would be advantageous to me. I know I have had many visual hurdles to overcome during the past 3 years. I sincerely hope that visually impaired students such as I are better prepared and more knowledgeable about the hardware and software available in the marketplace to assist us in our educational endeavors. Advocacy groups should be better informed of available technologies*
- *I believe the necessary information that is needed has not been available to me; I was unaware of government programs that are available to provide computers to students; I did not know about special software to aid the sight-impaired person*
- *I didn't realize that there were any computer programs that could help me out*
- *I discovered early in my university career that many people are simply not aware of the need for adaptive technology. If that need was clearly articulated, they would usually be very willing to accommodate it. Awareness for the need for such technology seems to be a prerequisite for its being provided*
- *I don't know. I am still learning about them (computers)*
- *I am unaware of software packages for the deaf that may help in my learning and studying at my institution*
- *I think computers are an invaluable tool for people with disabilities. The promotion of programs should be done for high school students so they are made aware of such technologies. Also more information could be provided via local organizations, if people don't know about the technology or services provided, they can't use them*
- *I would love to be made aware of all the different adaptive and unique technologies available. If I knew about them, and they would help, I would definitely purchase the product. It is hard to find out about new and innovative software and hardware advances. Alternative computer technology formats provide the key to my academic success, yet finding them is usually done by accident*
- *It is hard to find someone to inform you about the proper software and know how to use it, hard to find people to teach you how to use a computer effectively. Everything is expensive*
- *J'aimerais savoir ce que d'autres personnes avec des incapacités utilisent comme adaptations pour leurs ordinateurs, afin de comparer avec mes adaptations*
- *Lack of information to availability of technology for learning disabilities*
- *I think the biggest problem is probably information (lack of it) about what is available and how one can obtain it. I think most institutions would be willing to aid students, but often neither party knows how to do it. I personally researched a lot about adaptive technologies simply because I find computers alienating and dehumanizing*
- *There is a lack of information about what's available. There is likely software that would help me but I'm unaware of what it is*

Financial Concerns

- *My biggest problem is lack of money, not my disability*
- *Computer maintenance and service delivery; costs for servicing and manufacturing engineering technology systems; costs for insurance; coverage of computer equipment and insurance coverage policies for computer system only*
- *A lot of programs are oriented for Apple computers and not IBM computers, in particular, spellcheckers for IBMs are too expensive for my needs or their levels are grade school level*
- *Allowing students more say in what kind of programs/hardware they purchase. Increase funding and allowances for upgrades*
- *Computer software should be free to people with disabilities because theses people don't usually have a lot of money. In my own case I am married with three children on a fixed income. Software is so expensive there's never enough money. Things are changing*
- *I didn't know you could get funding to buy a computer. Next time I need one or need to upgrade, I will look into it*
- *Funding for out of province students for business for computers*
- *With recent cutbacks, there has been less funding available to disability agencies. This has caused manufacturers to experience a drop in sales. This has deterred them from continuing research on development. All of which means that the adaptive industry will not keep up with the changing pace of the computer industry. This will be a barrier for disabled people in the future. We will fall behind the emerging technologies and lose access to computers*
- *I would like the ministry of education to be more involved (and not the more bureaucratic Medicare System) in the support of hard of hearing students, especially regarding technology. Notetakers by another person is a very limiting service (in many cases) as a student needs to screen information independently, autonomously, and discern what is important info. This is particularly important in the social sciences. Simultaneous transcription such as C-Note is excellent when done "verbatim" by a stenographer, however, this system is available to students who usually attended school with an interpreter i.e., deaf students. I would like the Ministry of Education to allow students with different degrees of hearing loss to obtain the proper assistive listening devices such as FM systems with good discrimination capacity (that can leave out background noise) under the special needs program. Tape recorders and good quality hearing aids are not covered either. Students should be permitted to upgrade their hearing aids through the Ministry of Education programs. Medicare programs are weak, they don't take are educational but rather medical approach*
- *I am not aware of the government program, but I would be very interested to learn more about it*
- *I am very concerned about the funding, I find the waiting and interviewing stage makes me very anxious, and I don't bother for the things I need*
- *I do not think that it was fair that I was turned down for the computer bursary just because my tuition and books were paid for by another association*
- *I have applied for a government grant for a computer but haven't received the money yet*
- *I have wanted a computer for the longest time. There is no government funding in this province that I'm aware of to purchase one*

- *I just want to let you know that I have never heard about government programs that are available to people with disabilities*
- *I would like to be able to dictate my essay. However, I would need to upgrade my computer and it would be expensive*
- *If there are programs that will help people buy a computer or software that would be nice if they were published to those who need them*
- *In Ontario, there are 2 funding programs I used because I could get equipment that I need and use on a daily basis - Some programs are not flexible enough to take into account what I need. There is also no allowance for totally integrated workstations (i.e. a computer scanner and CCTV). It's one or the other, this does not allow effective use of the technology*
- *It is very hard for a student with disabilities to get access to quality computer lab time because the lab closes when the classes are over. Other times there are constraints on the time a student can be in the lab. Because more students are on limited income it is difficult for them to get a laptop to use at school. The number of learning disabled students at college is very small and the expense doesn't fit in with other school income. The expense is too great for the number of student that need it*
- *J'aimerais que le gouvernement peut aider les finances pour les sourds. Ceux-ci ont besoin d'apprendre les choses. Les sourds ont beaucoup de misère de la vie. Par exemple, les sourds ont manqués d'informations, des nouvelles et des connaissances. Il faut avoir d'ordinateur pour les sourds car ils veulent apprendre. La majorité des entendants ont plus de connaissances et appris les nouvelles que les sourds. C'est pourquoi parce qu'ils ne connaissent rien d'ordinateurs. On doit offrir les spéciaux d'ordinateur pour les sourds ou les handicapés. Les entendants ont appris beaucoup et vite. Il faut avoir l'ordinateur pour les sourds*
- *Puisque ma santé m'empêche de travailler, je ne peux pas payer un pour faire des travaux à la maison (ils sont beaucoup trop dispendieux). Si il y a un programme qui peut m'aider j'aimerais le savoir*
- *Je voudrais tant avoir un ordinateur, mais le programme de prêts et bourses ne me le permet pas même si j'ai une déficience fonctionnelle majeure (la surdité). Ayant plusieurs preneurs de notes, on ne me permet pas d'avoir un ordinateur car mes preneurs de notes prennent la place des ordinateurs. Ils ne sentent pas le besoin que j'en aie un. Il aurait fallu que je n'aie pas de preneurs de notes. C'est un manque de justice!! Est-ce que je suis la seule ou pas*
- *Much of the equipment is expensive and I feel that manufacturing companies take great advantage of me as a result*
- *My only concern is, I have spent 5 years trying to get funding for a home computer and have had no success*
- *Pour tous les personnes handicapées devront avoir une subvention à cause de leur besoin pour soit à l'étude ou autre. Pour que les gouvernements nous encouragent à aller aux études avec les autres étudiants*
- *The lack of affordability is a big issue for me*
- *What about free computers? Or software which is compatible with previous versions*
- *When I have an old computer, that a person cannot fix or update and the money isn't there to buy one. Computer labs at the college are full or you don't have the transportation to get there*
- *Finding out what computer technologies are available for disabled students; I found out info at college but not at university. Price for manuals / user modified and training was handsome*

- *Grant for a computer did not suit me as my husband made to much money and I did not qualify for one*
- *The college has a grant program I qualify for, but I'm not allowed to get a computer that will read the work I've done so far, and I can't waste the last 7 years*
- *Grant should let students buy for themselves if they choose, not force us to have never-functioning computer systems with no chance to return it to the store for service or replacement*
- *Although I can type very slowly with one hand, using adaptive software should make my life easier. When it is not installed correctly, and I am not given training, this poses a problem. Also, paying taxes for a grant seems ridiculous to me; the grant is supposed to make my life equitable, not more difficult*
- *Need to see and handle a system to see if it will work for me. Money is also a factor*

Problems With Computer & Applications

- *My voice activated computer at school is not available and no one there to help on weekends, evenings when I need to do essays; other students using it when I'm gone; no good teaching program; just secretary trying to explain how to use the program. Due to dyslexia can't spell or type and the program when I tried it kept misinterpreting what I was saying (e.g. giving it the direction "choose 10" as a command to save the material and the computer typing "Houston" over and over). I have trouble following directions as it is so would need a step by step training class to be comfortable with the computer. I need to learn this as now I have family who type my essays for me, but if I go on further, I will have to move away so I really need to learn to use computer. It seems frustrating*
- *Adaptation that I require is proper physical set up of computer, proper height of monitor, keyboard and chair, and easy access to hard drive to turn on computer and put in disks, etc. The computer labs I worked in were not set up properly. No computer is with ergonomically correct chair to decrease pain induced sitting time*
- *As totally blind computer user, there are many instances when the screen reader I use does not work. When the screen reader stops working there is not much I can do other than reboot the computer. It can be very frustrating at times. Also, in the classroom environment, I find it difficult, if not impossible, to follow the instructor's examples on my computer. For example, in one of my computer classes we were asked to use a search engine on the internet to find something. There was no way I could follow the instructor's instructions and listen to my screen reader at the same time. I guess if I had one wish it would be that one could go get the computer training one needed in a friendly environment. I think more blind people would become employable if that were the case*
- *AutoCad at school is difficult to use because any special toolbar settings I use are changed when I return to use AutoCad; only stand in line to use it. The hard floors and long waits aggravate my pre-existing back injury to the point that I generally have to come in on weekends, stay late or come in early*
- *Awareness of what is out there; adaptation for someone using hardware (e.g. foot bar, smaller keyboard, etc). Restrictions on what is considered a disability and what is not. I always fall between the cracks*
- *Closed captioning; most teachers don't know how to operate it, many programs are out-of-date and are not closed-captioned*
- *Different mouse styles for PP1 with repetitive motion strain*
- *Ease of using computers (laptops) in classrooms - plug in - where? And battery problems (only lasts 2 hours maximum)*
- *Evaluation des synthèses vocales*

- *Getting effective computers to students and packages for statistics*
- *Hardware and software are readily available for IBM but not for less common platforms such as SPARC workstation. Software is just now starting to become available for Windows. Zoomtext 7 will work on NT whereas Zoomtext 6 doesn't. I suspect this is due to the fact that UNIX based systems would require a rewrite of the operating system code. I hope that I am not a biased source, since I am a computer science student. I do use and maintain a variety of computer systems*
- *Some hardware has proven to be difficult to work with and some may require purchasing self-help manuals*
- *I believe that hardware and software upgrades are not as current as they could be*
- *I find the glare on the monitor difficult. Wrist rests should be built-in*
- *I have used software (briefly) belonging to a staff member at the disability center. The software seemed to be lacking in efficiency despite the fact that it was superior to previous software, and it was the most advanced technology of its type on the market. Advances need to be made in the direction of speed, normal voice recognition (regular speech) and adaptability to individuals users*
- *I have voice recognition English, but since I started at college, I need it in French. Wonder if that exists*
- *I just use the note taker and basic computer technologies*
- *I just want to say that voice activated software is very frustrating and time consuming. It needs to be made more user-friendly*
- *Any extensive sitting at a keyboard hurts my hands (arthritis), back, and neck*
- *I need mobile technology because of the narcolepsy (need to pack quickly in order to take my naps*
- *I use a large font size or zoom to blow up the screen. However, this is not as good as the packages available for blowing up the screen*
- *It would help if one station per lab were set up for students with special needs (i.e. work surface is adaptable in height/angle, chair/seating arrangement allows for wheelchairs, canes and crutches). My disability is considered invisible, therefore less important. I am left-handed and mouse with my left hand at home. I had to argue to allow access to handedness in Control Panel. I have yet to convince them that the physical space required for mouse and mouse pad is just as important. This is an obstacle to learning. This has become a learning disability due to elevated level of frustration*
- *A cheap way to get info to blind students using available technology. It is just a matter of getting into the habit of making a disk copy*
- *J'ai utilisé Dragon Dictate pour écrire*
- *Je n'ai pas d'ordinateur à la maison, mais présentement je suis un cours en infographie et j'ai aucune difficulté a m'en servir*
- *Je suis malentendante et j'adore les jeux, mais la plupart des jeux ont une voix dont je ne peux comprendre. Il devait avoir des soutitre (comme à la télévision)*
- *Keyboard-45 degree angle ergonomics*
- *Kurzweil Voice type, read K100; K300 say it types*
- *Les technologies disponibles pour les personnes malentendantes*
- *More computers available with mouse instead of buying a mouse separately just to use computers at school*

- *More often companies advertise their product with voice or music or/and new software products are introduced with voice and for deaf people. That is frustrating! Hence my notes about closed caption device. That could be pre-installed in the computer*
- *My disability is not physical. I have a learning disability where I have problems translating what I hear to what I write and from what I know to what I write. Spellcheck and grammarcheck helps a lot*
- *My own experience with dictation software has not been satisfying. I have great difficulty loading the program. I had to buy an adapter to boost power to the microphone. There's no technical support or training. Formatting with it is very tricky. And the program used to crash my computer and I'd lose my data, sometimes whole assignments*
- *Need better voice software, scanning services, and disability options on all software/hardware*
- *Not enough computers to meet the needs of students*
- *Adaptive technology has not as of yet been able to resolve the many problems regarding music*
- *Many CD-ROM's like Microsoft Encyclopaedia do not have captioning along with the narration in any of the video clips. This would be beneficial to the deaf and hard of hearing*
- *Seemingly no discussion of ergonomically-related equipment*
- *Smaller, lighter equipment that could interface with a regular computer*
- *I want more advanced spelling, grammar and the software (including university terminology); more info on how to inform the manufacturers of my needs would be useful. More info on how to gain knowledge about government support programs to supply students with learning disabilities with computers would be useful*
- *En effet, ce qu'il faut savoir qu'un ordinateur qui « crashe » est dû à 99% à une déficience du système d'exploitation de celui-ci. Or, moi, étant un grand utilisateur du Windows et de Linux (ou un clone du Unix). Je peux vous dire qu'il y a un très grand changement entre ces deux par rapport à la stabilité. En effet, il y a eu des tests et les résultats ne m'ont pas étonné. Les résultats, les voici: (test sur la stabilité de la gestion de réseau) Windows « crashe » aux 21/2 minutes Linux/Unix n'a jamais « crashé. » Alors, il faudrait peut être spécifier le type du système d'exploitation utilisé (il y en a environ 8 à ma connaissance)*
- *Voice program doesn't work well. One crashed (Dragon) after 2 months of use - incompatible with my laptop (Eurocom). Cannot seem to get Via Voice trained. Would be great if companies listed compatibility programs and computers*
- *Upgrading. The newer stuff takes more and more then you need to upgrade as well so it makes it tougher*
- *Une caméra vidéo avec logiciel qui permet (sous-titre) d'écrire ce que le professeur a enseigné car l'information incompris pourrait être reprise jusqu'en parfaite maîtrise par le vidéo. Ou dans ce cas la, un professeur attitré spécialement pour l'étudiant dans le champs d'étude pour qui l'étudiant maîtrise très bien la matière (compréhension), plutôt qu'en groupe. Comme par exemple, je suis en soins infirmiers, l'information écrit cela va, quand à la pratique de groupe, je ne comprends pas les détails associés a tel événement*

- *They need to make better spelling/grammar program in word processing programs*
- *I am not aware of the existence of a decent quick math word processor nor can I afford a decent portable*
- *The students with disabilities office and staff are wonderful. I could probably get a computer. But I choose to wait until 2000. I'm not confident enough*
- *The screen is very tiring on my eyes (poor color adjustment). If there is a better color arrangement to cut down on the glow and adjustment between letters and background*
- *The size of screen the government gave me on my laptop is 3" smaller than what was recommended. Using this screen causes me frustration and discomfort. Also the screen disappears under certain light which is frustrating*
- *The biggest problem with tech aids is poor design and slow advancement. Software never does quite what I need. Hardware is usually bulky, expensive, ugly and barely functional. Since there is no high demand for the sort of stuff I need, there is little development of it unfortunately. Stuff has to be designed in part by the people who use it*
- *The companies producing the technology need to look at better support for their special needs clients. More time for support, manuals on tape, etc.*
- *The computer I received in the past proved useful once I was able to obtain some basic software myself. The hardware was very up to date when I received it, but by the time I got software it was somewhat outdated*
- *The development of RSI friendly keyboard plus technology such as speech recognition software. The ability to use Windows without a mouse. The ability to use the Internet without a mouse*
- *Something to make the screen not so bright. Some days my eyes really hurt*
- *Technology helps students a great deal, they need to have simplified instructions on how to adapt the software and make it a comfortable process to help them develop their learning skills, without fear or frustration*
- *I hope in the near future that computers will be more friendly and more equipped with a manual that is as easy to read as a children's book*
- *I got a computer, but it was so old (that was 1990 model computer) and doesn't have any programs from my school program*
- *I had programs such as a math tutoring program where it was an educator teaching math. This program had become useless for I am hearing impaired where I cannot hear what this educator is saying. There are other educational programs with spoken lectures or media, films with person talking in the background. Again, nothing is understood*
- *I have a friend that benefited a lot from having a computer in Braille display. At school there is none available, this makes it very hard for her to keep up with the rest of the class*
- *If it wasn't for a laptop from the school my marks would have suffered*
- *I feel that if speech software like Jaws for Windows could be installed on the main server of each college or educational institute, then it's very easy for the disabled students to have the college network access rather than to have a stand alone computer*

- *I understand or remember better when I watch material or listen to it, rather than read it. I'm not very comfortable with computers (somewhat afraid of them). Also can not afford to have a recent one. Have borrowed an old one (DOS) to try and I became comfortable with them*
- *As someone who graduated, my home computer has allowed me to work from home as a freelance writer. I feel access to this technology will lead to more ability to find suitable work*
- *I don't really need major adjustments for my computer needs because I'm deaf. I can see and can move well. The only concerns I have is that technology, especially computer programs and games are now using more and more computer voices rather than text dialogue. Currently, the programs are good with text but games are now omitting the text options. I hope no one will do that with the programs. I am not only speaking for myself but for other hard of hearing and deaf people out there using computers in their daily lives. We need to continue to remind the providers of our needs*
- *I need a program like Dragon Dictate to obtain my timings. If I don't obtain my timing it is unlikely I will obtain my certificate for office technology. I was funded for Dragon Dictate which I have on my computer now but I do not know how to do timings with Dragon Dictate. I want to make Mavis Beacon typing tutor and Dragon Dictate compatible so that I can do timings with Dragon Dictate but so far I can't figure it out. I will be taking the program to school to see if the computer support technician can help me. I don't know if I am going to get my timings. The standard is 40 wpm and the fastest I've done is 32 but those are rare. I average about 28 wpm because I key with one hand. I also drive with one hand and foot and I travel 110 km a day to attend school. If they can figure out how to make Dragon Dictate compatible with Mavis Beacon it would be much appreciated*

Training

- *Not enough training*
- *Other areas that might want to be explored are what students actually use the computers in school for, e.g., do they use computers for mathematics, English, chemistry, economics, statistics, etc. This might be of use to see what areas the adaptive technology really helps while in school*
- *Iit would be nice to have training provided for 1st time computer users who are technophobes as I am*
- *Computer manuals need to be easier to read with less computer jargon and minimum monotony. I think it would be amazing if my school had a small class or workshop (does not have to be for credit) that had maybe just a few 1 or 2 hours sessions teaching all the basics of everyday computer skills (i.e. using word processor, downloading things from internet, etc.)*
- *I know having a disability is very difficult, in my opinion technology is moving too fast, students like myself need proper training (internet use and so on). If there is enough funding I believe there should be a course for disabled students (learning disability) that helps us feel more relaxed with computer technologies and how to use them*

- *I am a user and a teacher of computer technology. I think that in general, institutions are not conscientious enough in providing adaptive technology to students with disabilities on campus. Students usually have to rely on government funded programs to get the funding they need. There are not enough training facilities to train students how to use the technology*
- *I have come a long way with computers. Before I used to panic and get angry at the computer, but now I am getting used to the computer because I received a lot of help from the special needs area from staff and tutors. Also, it would be a great idea to explain how to use a computer and how to fix a computer when you make a mistake in easier terms for people who have a hard time understanding what they read*

Wish List

- *I am interested in this idea of big screen and print*
- *I have no money, broke many bones in body, lost eye. But would like to somehow get computer for home*
- *Updated equipment would be interesting to find out about. Many times we miss advertising for tools that could really help us. Maybe an update report could inform people. I would like to find out more about screen readers and notebook taking devices*
- *A Hewlett Packard scanner would be a great asset to read documents, books etc.*
- *A number to call that anyone could access to answer computer questions 24 hours a day, 7 days a week so when you run into a problem (a) it doesn't get out of hand, (b) doesn't cause further problems, (c) you don't have to stop working on your computer till you find out the problem and can fix it, (d) you don't spend hours trying to figure it out or looking up resources that might help*
- *Being able to scan in and use documents that are editable in a word processor would be the most beneficial to me*
- *Book on disk that can be read to student on the computer*
- *Closed captioning program/software. Software/program for me to develop screen saver, drawing, letterheads, etc. that I want to develop myself*
- *I wish that there could be technologies for hearing impairment, such as when there is a lecture, I wish there was some sort of technology that you can read it off when I can't hear lectures*
- *Dictation and voice-activated products are my main need and interest*
- *Have heard about video interpreting in sign language (last I heard in 98 it was experimental). Any changes? Would like tech (adaptive) that's not necessary to be priced reasonably*
- *I like a program called Via Voice. It allows you to dictate a letter and it writes it on the screen. You don't have to know how to spell or type, which can be a bad thing if you learn to depend on it*

- *Je suis seulement sourde, donc, je n'ai pas vraiment besoin de matériel adapté. Seulement, j'aimerais beaucoup avoir, s'il existe, un ordinateur portatif, assez petit, qui enregistrerait la voix de mes professeurs et la recopierait sur l'écran afin que je manque aucun mot de ce qu'il dit. Mais je ne crois pas que ce genre d'ordinateur existe*
- *Comfort-chairs, mouse pads, keyboard pads, resolution displays - due to certain programs used by the college*
- *I'm not blind but have given presentations hand-outs, etc. and would like to have option of printing these up "in-house"*
- *Have more programs to help dyslexics but because I don't know what's out there I shouldn't make that judgement*
- *I would like to see the computers at school compatible with mine at home. I also would like to see them be easier to use*
- *I think handheld computers and laptops would make note taking easier on me. I wouldn't mind if the government just paid half the cost of a laptop computer, at least then I could pay for the other half*
- *I wish software was more available to me but that is a dream. Software I need is not a luxury, but a necessity*
- *I would benefit from having access to "computer technology for disabilities" catalogues*
- *If there are any computers at my school I can use, I don't know about them. I wish I could, but I don't know if they are available to me*
- *I do not need adaptations. However, they would improve my research and writing skills incredibly, as well as (possibly) helping my comprehension and study habits. I would use a scanner and a screen reader, dictation software and electronic format books for my studies if they were affordable and if training were available*
- *It would be a great help to have the use of a computer at home. At school we use windows 95, 3.1 and Corel Word Perfect 8*
- *It would be nice to see schools equipped with adequate hardware/software for students with disabilities*
- *Existe-t-il un petit appareil (magnétophone qui fonctionne avec un CD ou CD-ROM) qui pourrait être lu par un ordinateur et même être transcrit sur l'écran*
- *J'aurais aimé que les établissements collégiales puissent nous fournir les programmes d'ordinateur, car ils sont trop dispendieux pour avoir tout ce dont j'ai besoin*
- *Manuals for one-hand typists. Software etc. Amount of on-line info updated*
- *My main concern is I try and use the computer to e-mail professors and do class assignments. Getting books for my class for the computer is wonderful idea. I wish that my campus would provide more on-line support*
- *Spellcheckers that have a good grammatical checker; the one I use causes me to make mistakes. Dictionaries, software would be useful too*
- *Textbooks on CD-ROM where reading (hearing) and viewing would become much less time consuming for those with LD's and visual impairments and others if applicable. Following along during lectures would become possible for some*

- *Most adaptive hardware and software is available to me and I did not know it even existed or that it was an option for me. I have bad penmanship and like the idea of using dictation software because I usually don't write my essays. I usually work out rough ideas then type them. Dictation would make my work more coherent and follow better. I would also think that portable notetakers other than a lab would provide me with more participation in class. I have also a tape recorder for some classes but did not find that helpful. However I only tried that for a month so I may try it again. However I did not find recording my own notes helpful in this area*
- *Voice command. Big screen and a computer that reads the text back to me. More icon applications instead of words, typing is hard and slow process for me*
- *Did not receive a printer when I received the computer equipment. I am still waiting for it*

Recommendations

- *Computer technologies issues: technology for hearing impaired people should be explored more in-depth*
- *I have been quite fortunate to have received the funding and equipment in obtaining a computer as well as adaptive computer equipment. However, the process was long, frustrating and discouraging at times. The info and resources that I know and am aware of now would have been most helpful early on in my studies. The biggest concern I would have is the lack of awareness and exposure of such useful and beneficial programs. I did a lot of my own ground work and research before I came across the proper channels. Maybe incorporate some info., brochures, programs or guest speaker talks at local high schools, community centers and churches. I know if I had some exposure to such programs earlier on, I believe my success in completing my educational goals would have been less bumpy in which my physical and mental energy would have been channeled more towards my studies. I am grateful and very appreciative of what guidance, help, and financial assistance I did receive*
- *Suggestion for manufacturers--produce generic speech chip that can be attached to all electronic equipment. This way all manufacturers could include standard plug*
- *In my career, I am expected to spend most if not all of my day on the computer. This has lead to RSI and permanent long-term problems with my hands, lower arms and elbows. This makes it very difficult for me to recommend the use of computers to anyone. While I think access to appropriate software and hardware is important for all students, something has to be done about the high incidence of RSI first and foremost. We need to keep all users from developing problems such as mine*
- *This may be outside the strict mandate of the study: I would like to see a major effort by technology developers toward providing a generic speech chip that could be attached to the vast array of digital devices that are now in use - everything from bank machines to digital phones to microwave ovens to VCRs to volt meters to lab equipment and (my personal favorite) global positioning units. We can not expect the manufacturers of all these things to add a voice unit. What we need is someone to develop a unit that can connect with a wide variety of instruments. Then we would only have to ask manufacturers to provide a plug by which we could attach our speech unit to the instrument - how about a talking spectrophotometer in the chemistry lab or a talking multimeter in the electronics shop*

Unclassified

Impairment/Disability Related

- *How does this information help us deal with our handicap? What information is there out to help us deal with our handicap*
- *CD ROM's are impractical; you need to get a feel for the book, how it is put together, and be able to flip to any page anytime*
- *I have diminished motor skills and typing is slow*
- *I have dyslexia the problem of coordinating my hand movements to learn typing has been almost impossible. Excel was and is a difficult program to learn because of all the small data entries*
- *I had to relearn to use the computer after a car accident and I feel so connected to other parts of the world using the Internet*

Various Points

- *I have an unseen handicap. At 2 years of age I had polio - left me poor use of left arm and hand (unseen by most people). When I studied I wrote all essays and my husband typed them for me. I am now employed as a grade one teacher and have great frustration writing reports as, at that grade level, they have been anecdotal and can involve a lot of typing. As I use only one hand, I am very slow. I have phoned and found that it would be quite costly for me to have a keyboard adequate for me. I am currently investigating the possibility of using voice software but it will be expensive as I will need to buy a new computer as my older one is not fast enough. I find trying to see someone who can give advice is very difficult as I work full time. I need to see and handle a system to see if it will work for me. Money is also a factor as I have 3 children of my own who we have to continue to support in their education. I have been working only for ten years so will not have much of a pension, my husband will not have one, and so we must save money for retirement (so money is tight). Although we do not have a large cash flow the biggest problem is not only cost but also getting a system that will work for me. Finding people and time - willing to sit and work with me*
- *Adaptive equipment through government programs requires a minimum of 2 courses per semester. If less, equipment must be returned and application process started from beginning (take up to 3 months). When course registration is adequate, D.S.S. will apply for taped books on behalf of student. Books do not arrive until mid-way through the semester and generally are the wrong edition (taped books). Brain injury (and educational repercussions) not included or supported as a learning disability (very difficult to receive support or learning assistance)*

- *I would have liked to see my computer lab at my educational institution have a station set up for the disabled to use. I can not use the Internet without assistance. It is hard to find assistance when I need to either find information or just surf the net. I'm returning to my home province at the end of the school year, Apr. 1999, So my institution may not feel they should implement change. However, I feel this is an important issue the computer I have access to is in residence. I feel it will be removed when I leave. It was installed so I would not have to leave the building. When I arrived student services was in a separate building. They have moved since I have been there. There is an adaptable computer in student services, however the building is closed after 4:30 P.M. This why the coordinator of disabled students and the director of the residence installed computer in residence. I would also like to see the room used become accessible. At the moment, I need assistance opening the door and putting the head set on for the Dragon Dictate program. The door is locked at all times - I have a key for the door, but because my motor skills in my hands are slow I can't open it myself. The residence director was going to change the door himself, but there is lack of funds. What if someone else comes in the future! In my opinion, small universities do not get funding for specialized computers or stuff because the focus is on the larger universities*
- *I lack access to good information. Classes get cancelled, or they cost too much - and they don't answer all my questions. Technical support is usually so attitude laden as to be useless. I have stopped trying. Struggled from 1992 to 1996 and stopped trying. Why doesn't my Eudora work? The technician said "it must be you, it works for everyone else" "No " I say "everyone else has given up and removed theirs from this screen". Well he didn't like my assertiveness so he left. That was three years ago, the Eudora icon still sits there - a monument to... They seem to be proud of their equipment in the disabled students office but in my experience the human communication and common sense part is totally missing. The students are treated like children - I guess they can tolerate it as long as they are getting what they need - if not then they are treated like ungrateful children. I try and try until I get exasperated - then they have the excuse "It's your attitude". After years of trying (Since 1992) to cope nicely with patronizing nonsense, with being completely dismissed, it's my attitude? Like if I'm nicer the computer will function properly*
- *I have been doing very well in our computer lab. Yet the time may come when I will need special computer technology. I believe that good computer technology should be made readily available to those who have disabilities and need it*
- *I do not own or use a computer because (other than price) I have no idea how to operate it, nor would I know where to begin to understand it*
- *Since I have a grant, I do not have to buy a computer or adaptive software; and trying to get through university without one is close to impossible*
- *Computer/technology is very important to me but I don't agree that there is not enough computer aid for people with disabilities. I've always had computers in my life, it doesn't mean that I have the money for it but other people, especially deaf people are able to buy a computer*

- *Depuis la fin de mes études, la technologie s'est beaucoup amélioré et maintenant plus accessible pour les handicapés, par contre, il reste beaucoup à faire, surtout auprès des gouvernements (Ils font la sourde oreilles!! Lorsque vient le temps d'investir). Moi mon problème se situe souvent au niveau de mon travail. Trop gêné de demander à mon employeur, mais ils sont très ouvert. J'ai aussi beaucoup de difficulté à me procurer des films qui sont sous-titrés. J'aimerais pouvoir faire pressions auprès des gouvernements pour amender les compagnies de films à produire plus de films sous-titrés. J'ai fait beaucoup de chemin pour améliorer ma qualité de vie; étudiant j'ai profité des services offerts pour malentendant*
- *I feel computers are used by too many hands, just like a drug user*
- *I found that with me being a student at college and a mother, I found this very time consuming*
- *As a senior, computer technology is less important to me than it is for young beginning students for whom I believe the very best possible technology should be made available*
- *I have a notetaker with me in classes, for example, using a computer. I have not considered this as use of computer, but as a service. The issue of technology as assisting to education should be considered separately*
- *I have no problems using computers. Most programs are straightforward and very easy to learn the basics. Some of the advanced functions that no student ever uses are more complex but there is always a help file that explains what to do*
- *I have problems focusing. Lack tape player with reading feature. Therefore, I need a friend with me who is filling this form out. I have no government granted equipment. As a part-time student my opportunities to learn about computers are limited. Basically, I want to learn Spanish. To the best of my knowledge no foreign language software exists*
- *I received funds to buy a computer but not the money for training. Have had some help learning the programs but no proper training. Grants should provide training dollars*
- *I used to have knowledge about computers but forgot how to use them as I haven't worked on computers for years. But still know how to use WordPerfect to make a letter*
- *I would like to see computer courses available for disabled people to better understand how it works, how to maintain it and what to do when things go wrong. Compumaster has a two day workshop that offers the above but costs 499.00$*
- *I'm a student who is trying to learn how to read and write (beside having two head injuries, I'm also dyslexic). I'm 40 yrs. old and have been in school for the past 5 years. I've been in 3 different schools doing OK from a grade 1 to a grade 10 in 5 years*
- *I just switched to this computer related major just recently, I don't have much background in computer technology (before my disability I was in a science program). Therefore, I'd love to learn more about these issues*
- *Issues regarding multiple disabilities are important to me. I am blind and I only have use of my left hand*
- *It is very frustrating when calling by phone to get computer support only to hear a recorded message that always seems to disconnect before it helps out with what to do with computer*

- *It supports the cause of making education barrier-free for students with disabilities*
- *Je n'ai pas pris de subventions pour l'achat d'un ordinateur parce que mon frère m'a vendu son ordinateur: "il n'est pas à la fine pointe" mais pour le moment il réponds à mes besoins s'il venait à faire défaut je demanderais (selon les délais) si je serais éligible*
- *Keep up with what is being used out in the workforce, or in the homes*
- *Les cours fournis par l'institution sont trop rapides et les profs ne sont pas formés pour comprendre l'incapacité de l'étudiant. Pour les besoins des étudiants vivant avec un handicap, les cours devraient comporter un plus petit nombre d'élèves et une durée une fois et demie ou le double de ce qu'un étudiant soit disant normal. Les classes d'informatique devraient être formés que d'étudiants ayant un handicap et un nombre maximum de 12-15 étudiants*
- *Look into other areas where computers and tech may hold disabled students back. For example, our school is great at modifying the course calendar and telephone registration. Are all post-secondary institutions? I personally have a slight phobia of filling out forms because my LD makes it so difficult (stressful). Consequently, I avoid the student loan form, can't get adequate help filing it out, and so choose to work every summer in order to avoid the anxiety. If you are going to look at how friends affect choices, consider also how professors' attitudes play a role in students' decision to use compensating technologies*
- *My disability does not allow me to work on a computer for long periods of time (concentration and coordination problems). Computers need to allow the person using them more control over high intensity*
- *Need more people to consult with as to what will work for me*
- *Need network card to be able to print. Obtain software that I can take home to use on my computer as it takes me longer to complete the same task*
- *Person at school who is in charge of disabilities dep't has said they would like to get a room with computers for disability students only. However, this wouldn't work for me either as, to have other people in the room talking and so forth would drive me nuts*
- *Physical comfort is not an issue at my college and our chairs make my back really uncomfortable to sit for long periods*
- *The computer systems here are not designed to meet the needs of individuals with disabilities. Students with disabilities must seek assistance through the student services office. I feel that the needs of students with disabilities could be better met if my educational institution were to set up an office and informational programs to educate people about different physical, intellectual, and mental challenges. It would also be helpful to students with disabilities if the university were to improve its computer technology to make it more accessible to individuals with various challenges (I prefer the term "challenges" to "disabilities")*
- *My institution has nice equipment for use in the lab but access is restricted to me and it is too hard to track down the appropriate people to talk about this. I feel like just another number. A low priority number because my income is low and my marks are average. But good for a learning disabled person*
- *My biggest problem with computers is during exams in computer courses. For non-computer exams I can be in a quiet room by myself but I can't do this in a computer exam as there isn't a computer I can use that's available in a room just for me. I guess this problem is with environment, and not computers*

- *The aid for disabled students at my university is now helping me to get some tutoring on how to use the Internet and computer software that I use for research and report writing*
- *My own feeling is that it doesn't much matter if I have all of the hardware/software I need if the teaching staff can't get the material across to me because of a lack of adaptation on their part*
- *To have more computers in the center for students with disabilities. Also have the school tech update the programs faster, not at the end of my course. Have the school give more support in fixing the computers that are down because we are put at the end of the chain. I mean with the school techs*
- *I am fortunate because I have 2 computers at home, a great adaptive technology lab on campus and excellent financial and training support from friends, family, professors, TA's, and LD instructors. Unfortunately, many of my friends with special needs have not had such great resources and suffer because of it. I often see the need for improved training and financial support for adaptive technology*
- *Whenever I took a course, I preferred to have someone use the laptop to take class notes, it is easier to read than handwritten notes*
- *While I don't absolutely need special adaptations, I could use it healing from my injuries*

Note. One student's comments were omitted due to length, the general theme of the commentary was a lack of adequate training in the use of computers that met his/her specific needs related to his/her disability.